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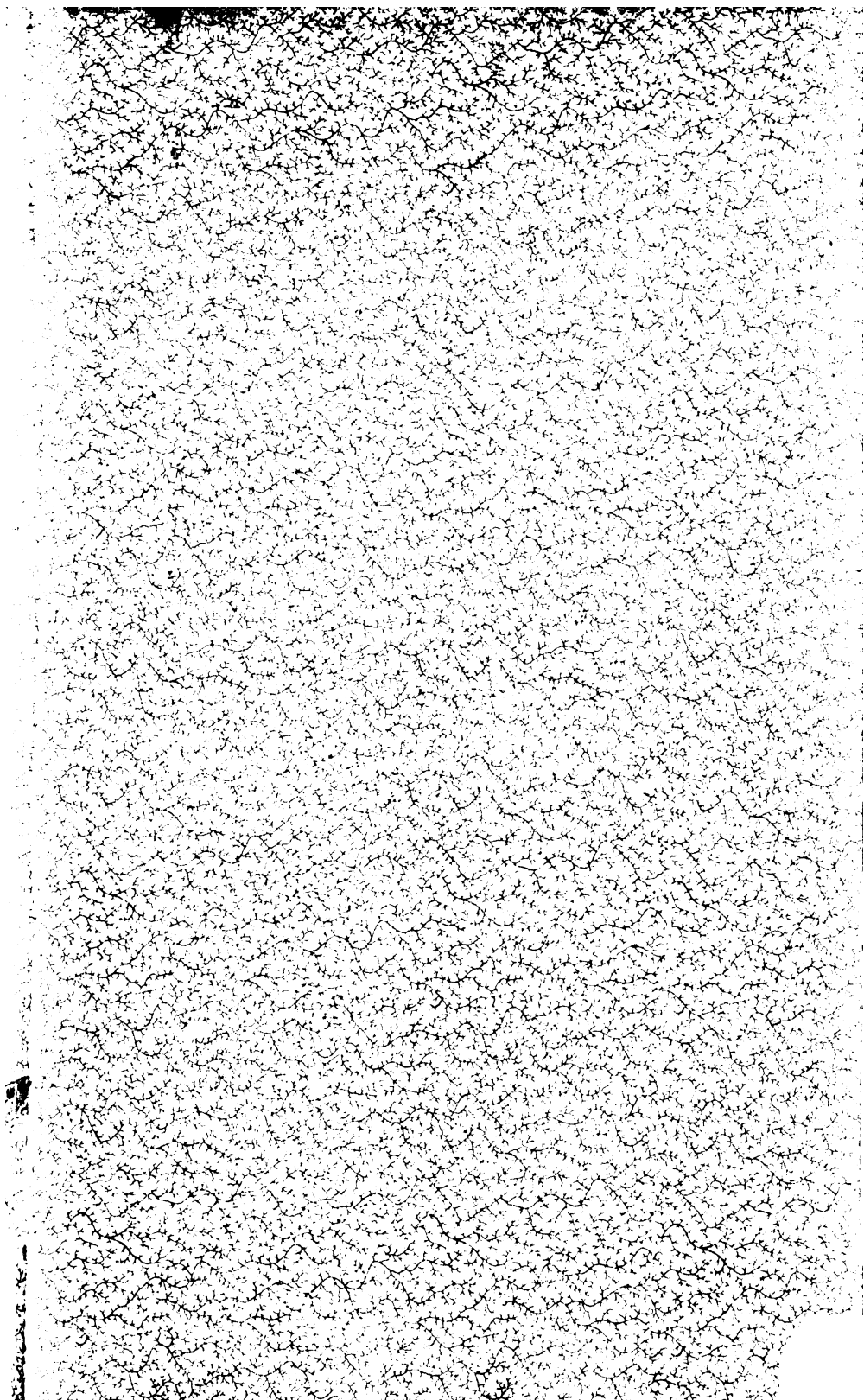
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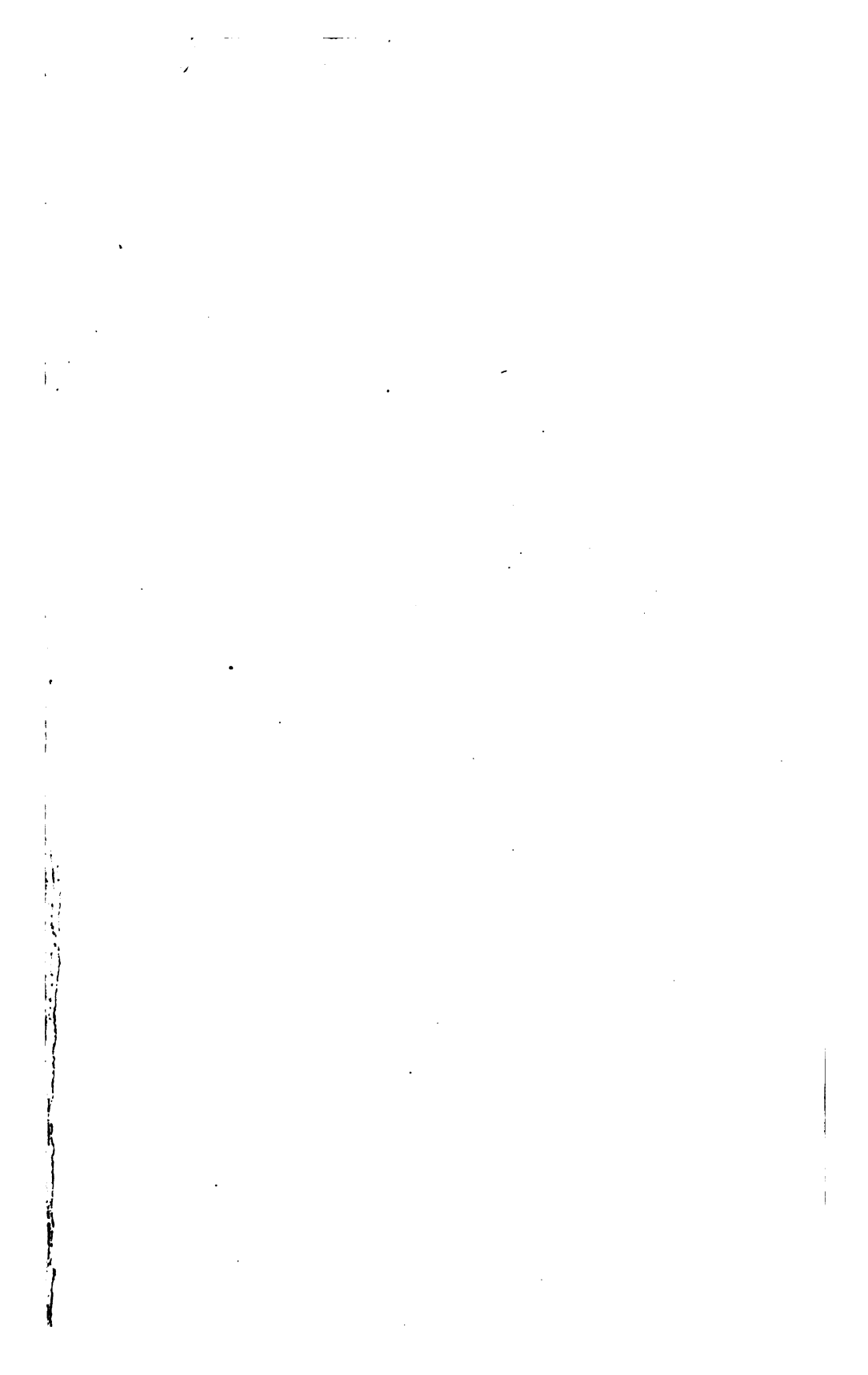
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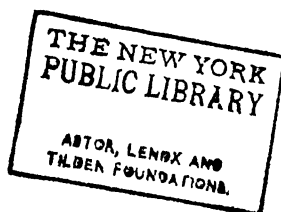






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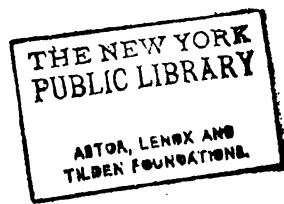


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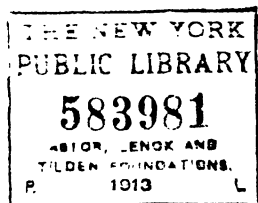
ON THE
CONSTRUCTION
OF
FIRE-ENGINES AND APPARATUS,
THE TRAINING OF FIREMEN,
AND THE
METHOD OF PROCEEDING IN CASES OF FIRE.

BY JAMES BRAIDWOOD,
MASTER OF FIRE-ENGINES IN EDINBURGH.

Now come the Men of Fire to quench the Fire.—*Rejected Addresses.*

EDINBURGH:
SOLD BY
BELL & BRADFUTE, AND OLIVER & BOYD;
AND BY W. J. TILLEY, FIRE-ENGINE AND HOSE MAKER,
No. 166, BLACKFRIARS' ROAD, LONDON.

1830. ✓



TO

JOHN ROBISON, Esq.

SECRETARY TO THE ROYAL SOCIETY OF EDINBURGH,
AND CONVENER OF THE COMMITTEE OF COMMISSIONERS OF
POLICE ON FIRE-ENGINES,

TO WHOSE KIND ATTENTION, AID, AND ADVICE

THE AUTHOR

HAS BEEN DEEPLY INDEBTED IN THE COURSE OF
HIS EFFORTS TO BRING

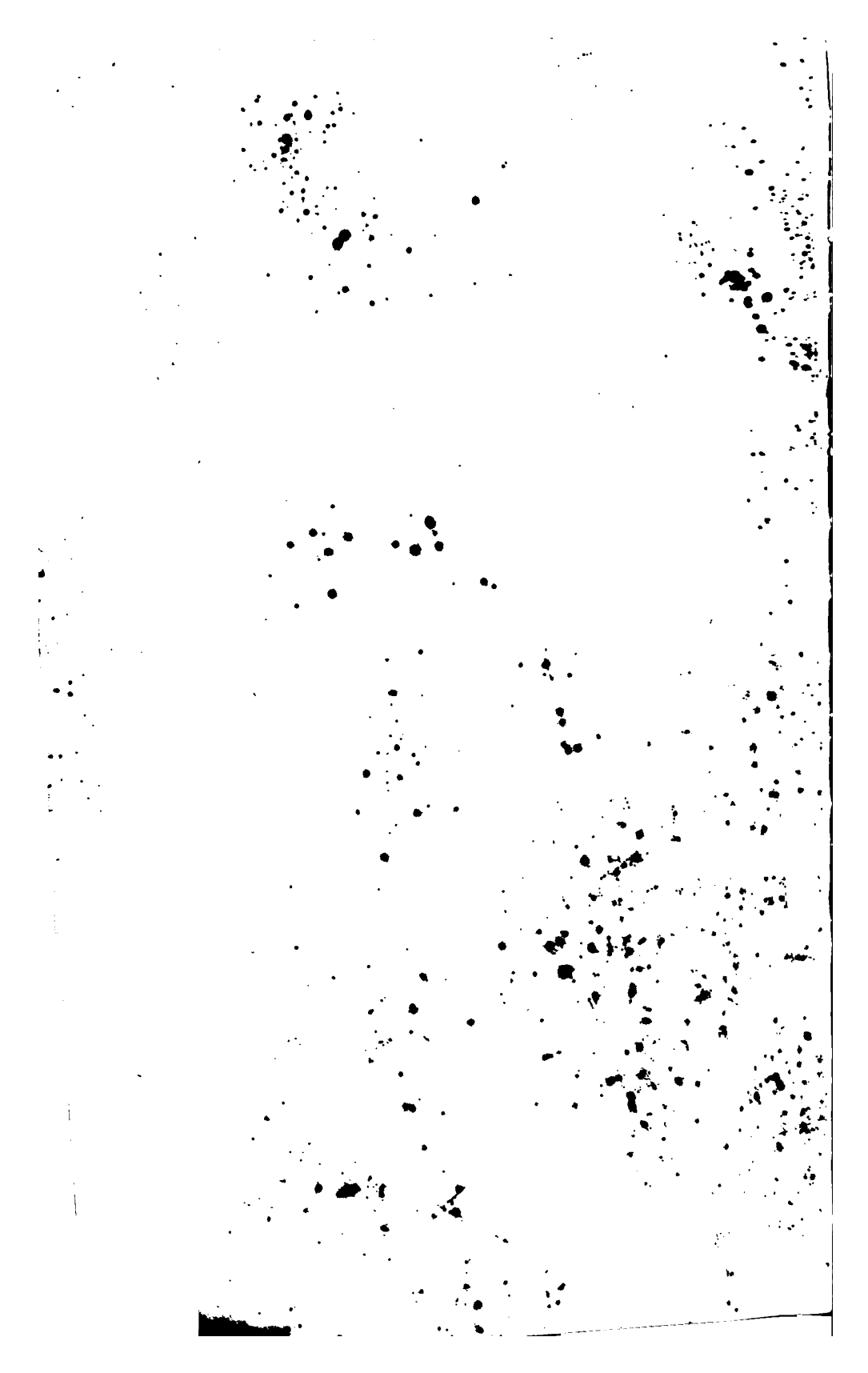
The Edinburgh Fire-Engine Establishment

TO ITS PRESENT STATE OF EFFICIENCY,

THIS SMALL VOLUME

IS RESPECTFULLY DEDICATED BY HIS OBLIGED
HUMBLE SERVANT,

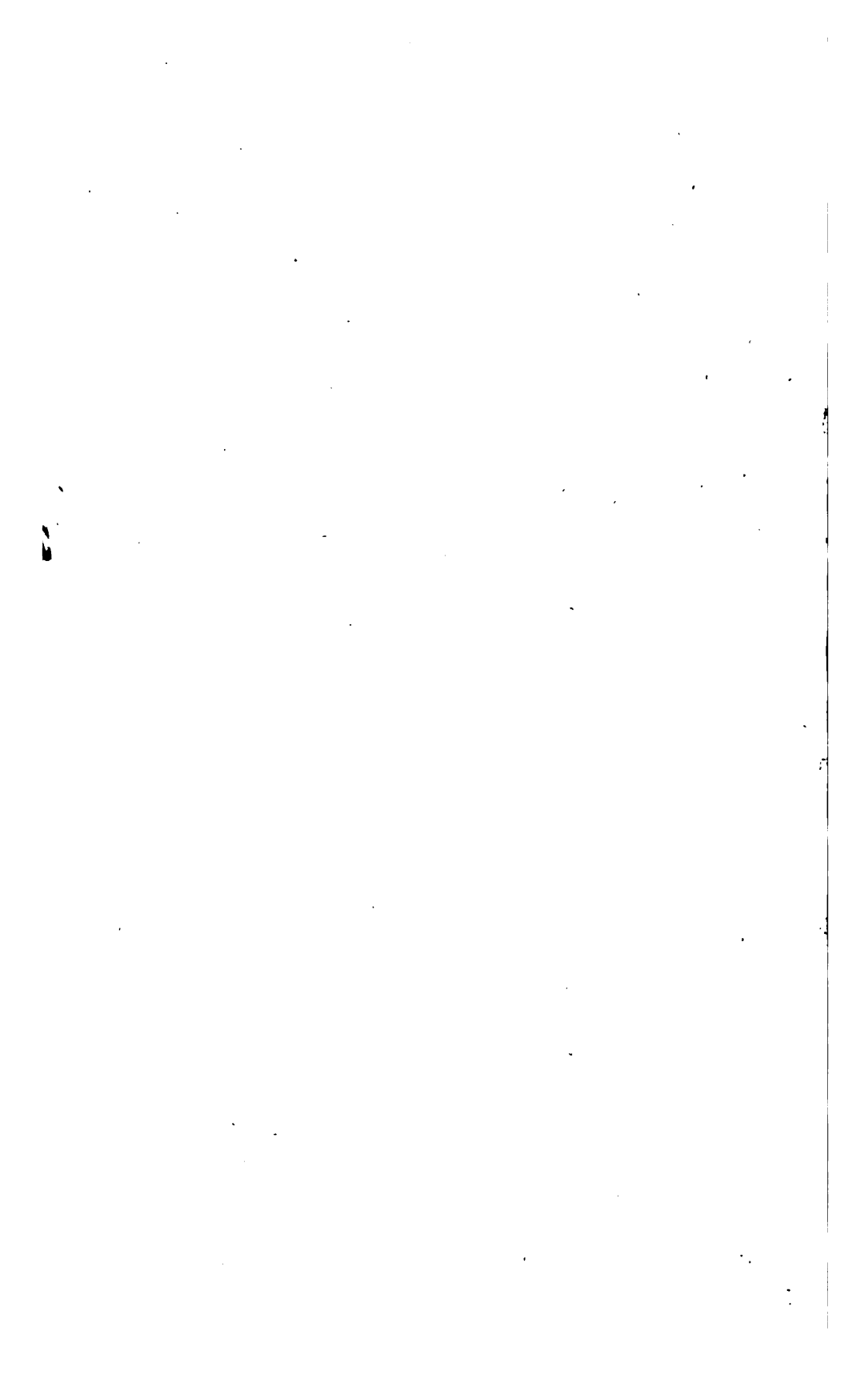
JAMES BRAIDWOOD.



P R E F A C E.

NOT having been able to find any work on Fire-engines in the English language, I have been led to publish the following remarks, in the hope of inducing others to give farther information on the subject.

FOR the style of the work I make no apology ; and as I presume no one will read it except for the purpose of gaining information, my aim will be obtained if I shall have succeeded in imparting it, or in directing the public attention to the advantage which may be derived from the systematic training of Firemen.

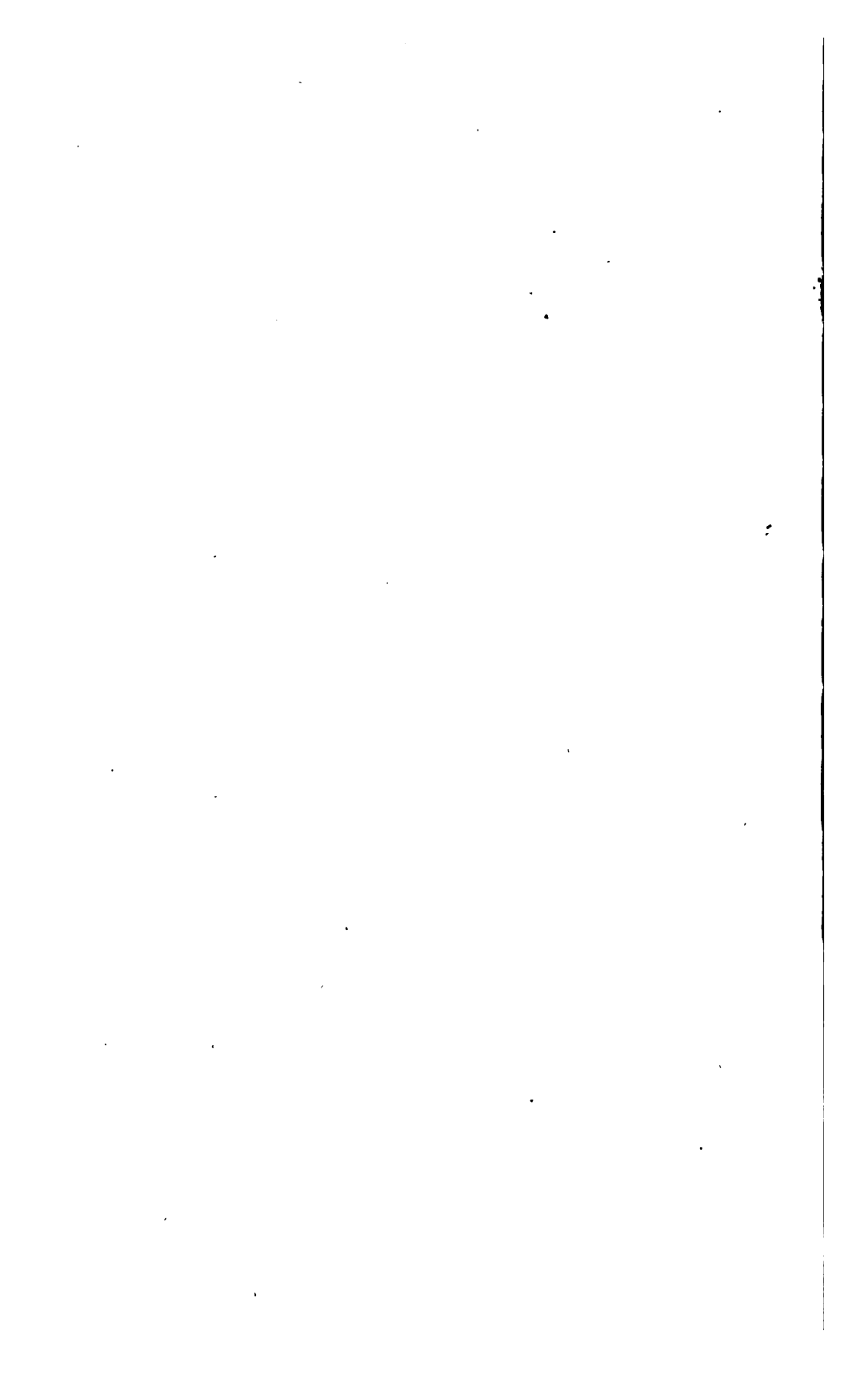


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ON THE CONSTRUCTION

OF FIRE-ENGINES AND APPARATUS.

DESCRIPTION OF A FIRE-ENGINE.

IN order that the reader may have a distinct idea of a fire-engine, I shall here endeavour to give a description of such a one as I conceive best adapted to general purposes,—the description being chiefly taken from those made by W. J. Tilley, fire-engine maker, No 166, Blackfriars-Road, London.

Plate 1st is a perspective view of a fire-engine.

The elevation, plan, and section, in figs. 1 of plates 2, 3, and 4, represent a fire-engine of six-inch barrels and seven-inch stroke. The cistern marked A in the figures above referred to, is made wholly of oak. The upper work B, and side-boxes or pockets C, are of Baltic fir. The sole D, (in figs. 1 of plates 3 and 4,) upon which the barrels stand, and which also contains the valves, is of cast iron, with covers of the same material, which are screwed down, and the joints made good with

A

common or artificial leather. The pieces E, at each end of the cast-iron sole D, in figs. 1 of plates 3 and 4, are of cast brass, and screwed to the cast-iron sole D, with a joint the same as above. In one of these pieces is the suction-cock F, and to the other is attached the air-vessel G, made of sheet-copper, joined at R, and attached to the piece E, by a screw. The exit-pipe H, in figs. 1 of plates 2 and 4, is attached to the under side of the casting E, by a swivel-screw. The valves I, in fig. 1, plate 4, are of brass, ground so as to be completely water-tight. The barrels K, in figs. 1 of plates 3 and 4, are of cast brass. The bushes L, in figs. 1 of plates 2, 3, and 4, are of the same material. The engine is set on four grasshopper springs M. The hind axle is kneed at the cistern. The shafts O, of the levers P, are of lancewood. The box S, in fig. 1, plates 2 and 4, is used for keeping wrenches, cord, &c.: it has a false bottom, and the space T below it, is used for keeping the materials necessary for a fire-escape, viz. a chain-ladder of 80 feet, a large canvass bag, and two strong belts; in the fore part of the cistern A, and the box B above the cistern, the hose is kept: the directors and suction-pipes are carried in the side-boxes or pockets C; the rest of the tools and materials are kept along with the above-mentioned articles, or strapped on the outside of the engine, in such situations as not to interfere with the working. Y is a bar for locking the shafts, to prevent them from interfering with the wheels, when the engine turns.

Having thus described a fire-engine, I shall now state why one of this size and construction seems best adapted to general purposes.

It has always appeared to me that an engine of six-inch barrels, is better suited for all ordinary purposes, than one either larger or smaller. When an engine is large, it not only requires a considerable number of men to work it, but it is not easily supplied with water; and, above all, *it cannot be moved about with that celerity, on which, in a fire-engine-establishment, every thing depends.* When the engine is brought into actual operation, the effect to be produced, depends less on the quantity of water thrown, than upon its being made actually to strike the burning materials—the force with which it does so—and the steadiness with which the engine is worked. If the water be steadily directed upon the burning materials, the effect even of a small quantity is astonishing. A six-inch barrel engine, at the rate of 24 strokes in a minute, will throw 41 gallons of water in that short space of time. Even more than 24 strokes may be made in a minute; but, when this rate of speed is much increased, the engine is liable to be damaged: indeed I have seen an engine worked for a short time at the rate of 40 strokes a minute; such a practice, however, is highly reprehensible. One of the great objects to be attended to at a fire, is the safety and preservation of the fire-engines; for, if these give way while working, it is rarely possible to procure others without a fatal loss of time.

In engines of the size I have described, it is also an advantage not unworthy of consideration, that two of them may be had nearly for the price of one large one; so that, if one happens to be rendered unserviceable, the other may still be available.

I do not approve of small engines for the service of large towns. Much indeed has been said about the convenience of conveying them up stairs, and into places where the fire is raging; but I fear that those who have so strongly recommended them, have seldom made the experiment.

I have generally found that all the fresh air to be had in a burning apartment is required, to enable a man to lie on the floor, and direct the water from the hose, while the engine is being worked by those outside. It is generally too, at the commencement of a fire, and before it has broken through the windows, that air is most wanted, the apartment being filled with smoke; and it is only at this stage that small engines can with any effect be used; while in general, the difficulty of applying them from the want of air, and the inconvenience of conveying water into a burning apartment, at the same time that the occupants are employed in removing their property, are objections almost insurmountable. I have no doubt that small engines may, in particular instances, have been useful; but I apprehend most of these cases might have been as well provided against, by a few well-applied buckets of water.

It seems to me, however, that the great argument

in favour of small engines, is the unwieldy size of which large engines are often made. If confined to six-inch barrel engines, I imagine this argument will lose its weight.

As simplicity is of vital importance, that end is better obtained by the adoption of one size of engine only, in place of having both large and small, which would but tend to render the subject more complicated.

In case it may appear that a very large stream of water may be required in some particular circumstances, I have only to state, that two engines can be made to work into a copper connecting-box, with valves inside; one hose may be attached to the opposite side of the box, and the whole of the water thrown by two engines, will thus pass through one branch-pipe or director. This, however, can scarcely be necessary, if the engines be brought up and put into action smartly, and the water made immediately to strike the burning materials. Indeed I always prefer two six-inch barrel engines to one, which throws twice that quantity of water; and, besides, by having two engines, the fire may be attacked in one or more points, as may be deemed advisable.

The cistern is made of oak, not so much to resist the effects of wet and drought,—good Baltic fir answering this purpose fully as well,—but in order that the iron work may get a proper hold, for which purpose, oak is better adapted than any other wood with which I am acquainted.

For the sake of lightness, the upper work and side-boxes are made of Baltic fir, strength in them being of less importance.

The sole is made of cast iron, it being cheaper than any other metal that could be applied to that purpose.

As the valve cannot be made without a rise for the plate to strike against, it will be observed, that there is a small step at each of the valves. The sole is carried through as high as this step, to admit of the water running off when the engine is done working. If constructed in a different manner, the water will lodge in the bottom, and produce much inconvenience in situations where the engine is exposed to frost.

The valve-covers are also of cast iron, fastened down with copper screws, a piece of artificial leather being placed between them, and the upper edges of the sole. Artificial leather, made of woollen cloth and caoutchouc, from its being more equal and compressible, is preferable to common leather for this purpose; common leather, although exactly levelled, may be of unequal firmness, and in that case it will yield unequally to the pressure, and be apt to render the joint twisted or leaky.

The pieces at each end of the sole, are of cast-brass instead of sheet-copper, with soft-solder joints, which are very apt to give way.

The suction-cock is the same as a common stop-cock, excepting only that it has three openings in the key in place of two. It admits the water in

two different directions, according as the key may be turned ; the one to supply the engine when water is drawn from the cistern ; the other for drawing water through the suction-pipe. It will be observed, that the key of the suction-cock has a screwed nut and washer upon it, instead of being rivetted, the screw being much more easily tightened than the rivet.

The exit-pipe is fastened by a swivel-screw to the bottom of the piece at the end of the sole. When a common screw is used for this purpose, the cistern requires to be taken off the wheels, when the exit-pipe needs repair.

The valves are brass plates, truly ground to fit the circular brass orifice on which they fall. The brass being well ground, no leather is used for the purpose of making them tight. The longer they are used the better they fit, and by having no leather about them, they are less liable to the adhesion of small stones or gravel. The whole valve is put together, and then split into a groove in the sides and bottom of the sole, left for that purpose.

The barrels are of cast-brass, with a piston made of two circular pieces of the same metal, each put into a strong leather cup, and bolted to the other. The bottoms of the cups being together, when the piston becomes loose in the barrels, and there is not sufficient time to replace the cups by new ones, they are easily tightened, by putting a layer of hemp round the piston, between the leather and the brass. This operation, however, requires to

be carefully performed ; for if more hemp is put into one part than another, it is apt to injure the barrels. The barrels are fixed to the cast-iron sole by copper screws, a piece of artificial leather being placed between the bottom of the barrel and the sole. The barrels are raised above the level of the cistern, that, when it is full of water, the oil may not float out of them.

The brass bushes on which the centre-rod works, must of course be placed high enough, to clear the walking-beam from the sides of the barrels. This gives the engine rather an awkward appearance ; but being attended with no real inconvenience, and giving the barrels the advantage of being always well oiled, is, I apprehend, a sufficient argument in favour of this construction.

When the engine is likely to be dragged over rough roads or causeways, it is of importance to have it set on springs, to prevent the jolting from affecting the working part of the engine, every thing depending on that being kept right.

The engines used in Paris, and the small ones belonging to the Edinburgh establishment, are made without springs, and mounted on two wheels, the carriage and the engine being separate, the latter being dismounted from the former before it can be used. In Paris, where the engines are managed by a corps of regularly-trained firemen, this may answer well enough ; but if hastily or carelessly dismounted by unskilful persons, the engine may be seriously damaged. It is also worthy

of remark, that the proper quantity of hose tools, &c., can be more easily attached to, and carried on a four-wheeled engine.

In order that the men may work more easily at the shafts, and suffer less fatigue, the engine is not higher than to enable them to have the levers easily under their command, and the hind axle is, kneed downwards, to give them this advantage. The shafts of the levers are of lancewood, being best calculated to bear the strain to which they are exposed when the engine is at work.

The air-vessel should be placed clear of any other part of the engine, excepting only the point where it is attached.

The fore-carriage of the engine, it will be observed, is made to suit the harness of coach-horses, these being, in large towns, more easily procured than other draught cattle. This can be altered, however, to suit such harness as can most readily be obtained. In Edinburgh, where horses are scarcely ever employed to move the engines, a pole, as in plate 3, fig. 2, is attached. Four men placed at this pole are able easily to direct the progress of the engine. When it is to be drawn by horses, this pole is removed, and the one for horses put in its place.

The pole in plate 3, fig. 2, is attached to the engine by placing the hollow pieces of iron marked V between the double eyes at U in fig. 1, plate 3; a bolt is then put through the three, and the pole is thus hinged to the carriage.

Two drag-ropes, each 25 feet long, of 3-inch

rope, with 10 loops to each, are attached, one to each end of the splinter-bar, by means of which the engines are dragged ; and to prevent the loops collapsing on the hand, they are partly lined with sheet-copper.

Twelve men are required to work the pumps of an engine of this size.

In the Edinburgh Fire-engine Establishment there are several engines on a plan something like the Parisian ones, but of superior power and better construction. They were made from plans furnished by Mr Robison, one of the commissioners, who has taken much interest in the formation and organization of the fire-engine department.

This description of engine is well suited to the service of country towns or private situations, where the larger ones may be unmanageable or too expensive, and where the engines are not required to travel any considerable distance. I shall here give a detailed description of them.

Fig. 1, plate 5, is the section of such an engine without the carriage. The stronger lines in fig. 2, plate 5, are a plan of the carriage, and the dotted lines show the engine as if placed on it ready for travelling. It will be observed that every thing is made as light as possible, consistent with strength. The cistern A, in figs. 1 and 2, is made of sheet-copper, tinned and supported by two iron hoops at B. The bottom C is of hardwood, covered with tinned copper. The cistern is attached to the frame D by the bolts F, which secure

the standards G. The barrels H are of sheet-copper, put together with hard solder, and drawn on a mandrel by machinery ; they are supported by brass rings at the top and centre, the bottom being soldered into a check in the casting below. The pieces I, K, and L are of cast brass ; I is screwed upon the piece K, a circular piece of leather with a valve in it being put into the joint ; K is fixed to L by a swivel-screw, and a valve is placed in the joint as before. The air-vessel M is then screwed on the piece L. When all the parts are set up in this way, the whole is put into the cistern, and secured by the bolts E. The pieces O on which the levers work are then, with the levers attached to them, put into the top of the standards, and secured by a screw-nut. The pistons are next put into the barrels, and the bolts put through the top of the piston-rods at P. It will be observed, that the lower ends of the piston-rods are spherical, and work in corresponding sockets in the pistons, forming very simple and strong universal joints. The pistons and leather cups are of the same description as those of the large engine before described.

The supports marked R are for the levers striking against when working, and are composed of two pieces of wood, one being placed on the outside, and the other on the inside of the cistern : they are bolted together, and secured at the top by an iron hoop. The pieces of iron at S are welded to the levers N, that the stroke on the supports R may be

perpendicular. If the pieces S be not put on, it will be found that the stroke of the levers has a tendency to drive the sides of the cistern inwards. The hose is attached at T, where a universal joint may be placed, if thought necessary. U in fig. 2 is a box for carrying the director, &c. of the engine, the coils of hose being strapped on, before and behind. The coupling-screws being alike, the hose apply equally to the large or to smaller engines.

The axle of the carriage is made with a crank, as shown in figs. 3 and 4, plate 5, and, instead of the carriage being made fast on the axle in the usual way, it has two wooden bushes placed underneath the cheeks, which play on journals turned on the crank of the axle. This mode of attaching the carriage to the axle in some measure serves the purpose of springs, as when the wheels encounter any obstacle on the road, the carriage swings forward, and thus saves the engine from the sudden jar which it would otherwise receive. At the points V there is a forelock, for the purpose of keeping the engine on the carriage when in motion. When the engine is to be used, the forelock at V is opened, the pole X is raised until the back end of the carriage touches the ground. The two handles next the pole are then taken hold of by two men, who thus raise up the end of the engine from the carriage, which is then withdrawn, and the engine set on the ground, the shafts being put into the eyes at the extremity of the lever. The engine is mounted on the carriage by reversing this movement.

The weight of one of these engines without its carriage is 4 cwt. The jet thrown by them attains very nearly the same height as that thrown by the larger engines; but the quantity of water at the same rate of working, is 32 gallons per minute, instead of 41. This size of engine requires 8 men to work the pumps.

The whole of the brass work of an engine should be of the best gun-metal, composed of copper and tin only. Yellow brass should never be used; even at first it is far inferior to gun-metal, and after being used for some time it gets brittle. The whole of the iron work should be of the best foreign iron.

Having thus shortly described the construction of a fire-engine, the next point is as to the manner of keeping such engines in good order.

When it is considered that their being in an un-serviceable state when called out, arises more frequently from the want of care in this particular than from any damage they may have received in actual service, or by the wearing out of the materials, it is quite plain that this important part of the duty, has not generally had that degree of attention paid to it which it deserves.

Although an engine were to be absolutely perfect in its construction, if carelessly thrown aside after being brought home from a fire, and allowed to remain in that state till the next occasion, it would be in vain (especially in small towns, where alarms are rare) to expect to find it in a serviceable condition; some of the parts must have grown stiff, and, if

brought into action in this state, something is likely to give way.

When an engine is brought back from a fire it ought to be immediately washed, the cistern cleaned out, the barrels and journals cleaned, and fresh oil put on them, the wheels greased, and every part of the engine carefully cleaned and examined, and, if any repairs are needed, they should be executed immediately. When all this has been attended to, clean hose should be put in, and the engine is again fit for immediate service. Besides this cleaning and examination after use, the engine ought to be examined and the brass parts cleaned once a-week, and worked with water once a month, whether it has been used or not.

In addition to the keeping of the engine always in an effective state, this attention has the advantage of reminding the men of their duty, and making them familiar with every part of the mechanism of the engine; thus teaching them effectually how the engines ought to be protected when at work, by enabling them to discover those parts most liable to be damaged, and to which part damage is the most dangerous. It is more troublesome generally to get the engines well kept when there are no fires, than when there are many. But the only effectual method of inducing the men to keep them in good order, in addition to the moral stimulants of censure and applause, is to fine roundly those who have the charge of them, for the slightest neglect.

In working the engines the utmost care should be taken to use them gently, as they are more frequently damaged by the furious and reckless manner in which they are worked, than by accidents, or the failure of any part of the machinery. When the engine has been properly placed ; before beginning to work, the fore-carriage should be locked. This is done by putting an iron pin through a piece of wood attached to the cistern, into the fore-carriage. This prevents the wheels from turning round, and coming under the shafts, by which the latter might be damaged, and the hands of the men at work injured.

Small stones, gravel, and other obstructions, sometimes find their way into the nozzle of the director or branch-pipe, from having dropped into the hose before being attached, or having been drawn through the suction-pipe, or from the cistern. Whenever the engine is found to work stiffly, it should be stopped and examined, otherwise the pressure may burst the hose, or damage some part of the engine. If any thing impedes the action of the valves, the pistons must be drawn, and if a person's hand be then introduced, they may easily be cleared,—constant care and attention to all the minutiae of the engine and apparatus being absolutely indispensable, if effective service be expected from them.

Considerable attention ought to be paid to the selecting a proper situation for an engine-house. Generally speaking, it ought to be central, and on the highest ground of the district it is meant to pro-

tect, and care should be taken to observe when any of the streets leading from it are impassable.

If, in addition to these advantages, the engine-house can be had adjoining to a police watch-house, it may be considered nearly perfect, in so far as regards situation. These advantages being all attained, the engine can be conveyed to any particular spot by a comparatively small number of men, while the vicinity of a police watch-house affords a facility of communicating the alarm of fire to the firemen, not to be obtained otherwise. When the engine-house is placed in a low situation, the men who first arrive, must wait till the others come forward to assist them to drag the engine up the ascent, and many minutes must thus be lost, at a time when moments are important.

After choosing a proper situation for the engine-house, the next care should be directed towards having it properly ventilated, as nothing contributes more to the proper keeping of the engines and hose than fresh and dry air. For this purpose, a stove should be fitted up, by which the temperature may be kept equal. When engines are exposed to violent alternations of heat and cold, they will be found to operate very considerably on the account for repairs, besides occasioning the danger of the engine being frozen and unserviceable when wanted.

There ought to be at least half a dozen keys for each engine-house, which should be kept by the firemen, watchmen, and those connected with the

establishment, that the necessity of breaking open the door may not occur.

DESCRIPTION OF TOOLS WITH WHICH EACH
ENGINE IS PROVIDED.

Having considered the sort of fire-engine which is best adapted for general purposes, I shall now notice the different articles which, in Edinburgh, are always attached to, and accompany each engine of this kind:—

- 6 coils of hose, 40 feet each.
 - 2 balls of sheepskin.
 - 2 ditto of cord.
 - 2 directors or jet-pipes.
 - 4 wrenches for coupling-joints.
 - 2 ladders, each eight feet long.
 - 1 boat-hook.
 - 2 keys for fire-cock doors.
 - 1 picker for ditto.
 - 1 distributer.
- } See description of fire-cocks.
- 50 feet of 2-inch rope, with a small hook at one end.
 - 80 feet of 2 ditto ditto.
 - 80 feet of $\frac{5}{8}$ -inch chain, with a large double hook do.
 - 1 mattock.
 - 1 shovel.
 - 1 hatchet.
 - 1 saw.
 - 1 iron crow-bar.
 - 1 turn-screw.
 - 1 piece of sheet-lead, 2 feet 6 inches square.

- | | |
|-------------------------------------|---|
| 1 suction-tub, with carriage. | } For description of these articles, see fire-escape. |
| 1 chain ladder 80 feet long. | |
| 1 large canvass bag. | |
| 2 strong belts. | |
| 1 strong steel cross-bow. | |
| 2 cones, with a cord wound on each. | |

Of these articles I shall endeavour to give a description as they stand in the above list.

The article of hose being first in order, as well as importance, merits particular attention.

The sort used here is almost all rivetted, and answers better than any sewed hose I have yet seen. This latter sort, indeed, is liable to many objections. If kept in a place where it is exposed to drought, the thread expands, and when brought into use, the seams leak till the thread is again contracted, by being completely wetted through, while from the rotting of the thread, the stitches are continually giving way. The thread is also very liable to be injured by the hose being dragged over a rough street, or into a stair or window, when full of water, or by any other means by which it is exposed to friction.

Several different plans have been tried to obviate this evil, but, so far as I have been able to learn, none of them have been attended with that success which can bring them into comparison with hose fastened with tinned copper rivets. A double seam has been made, copper-wire has been introduced into the heart of the hempen thread, and the original seam has been covered with leather sewed down on

both sides ; but none of these methods have been effectual.

All the rivetted hose in use here, is made by a workman in the regular employment of the Commissioners of Police, and has, on trial, been found greatly superior to any that has been purchased for this establishment, either in Edinburgh or London ; the latter being frequently found full of sewed-up warble-holes and flesh-cuts, the stitches in which are exceedingly apt to give way, and in consequence the hose becomes leaky.

Manufacturers of this article, for a very obvious reason, are not careful to select that part of the hide, which being firmest, is best adapted for the purpose. Indeed, I have known several instances wherein nearly the whole hide has been cut up and made into hose, without any selection whatever. The effect of this is very prejudicial. The loose parts of the hide soon stretch and weaken, and while, by stretching, the diameter of the pipe is increased, the pressure of the water, in consequence, becomes greater on that than on any other part of the hose, which is thereby rendered more liable to give way at such places.

Hose are frequently made narrow in the middle, and, in order to fit the coupling-joints, wide at the extremities,—a practice which lessens their capability of conveying a given quantity of water, in proportion to the difference of the area of the section of the diameters, at the extremity and the middle part.

In order to make them fit the coupling-joints, when carelessly widened too much, I have frequent-

ly seen them stuffed up with brown paper, and in that case they almost invariably give way, the folds of the paper destroying the hold, which the leather would otherwise have, of the ridges made on the ends of the coupling-joints.

In order to avoid all these faults and defects, the rivetted hose used here, are made in the following manner :—

An agreement is entered into with a currier, to furnish the leather at the time it may be required, under the following conditions :—The leather to be $9\frac{1}{8}$ inches broad, (that being the breadth required for coupling-joints of $2\frac{3}{8}$ inches diameter of clear water-way,) and levelled to the same thickness as a sample previously agreed upon. The leather used must be taken from hides of the very best description, perfectly free from flesh-cuts, warble-holes, or any other blemish, and stuffed as high as possible.* Not more than four breadths to be taken from each hide, and none of the soft parts about the neck, shoulders, or belly to be employed. No piece of leather to be less than four feet long. When ready for delivery, the leather to be examined and measured by the Master of Fire-engines, whose business it is to reject any, not agreeing with the above specification.

The leather being delivered, it is gaged to the exact breadth, and holes punched in it for the rivets, by a machine made for that purpose, see plate 6,

* Stuffing, a technical term used by leather-dressers or curriers.

figs. 9 and 10. In the operation of punching, great care must be taken to make the holes on each side of the leather exactly opposite to each other. If this precaution be not attended to, the seam when rivetted takes a spiral direction on the hose, which the heads of the rivets are very apt to cut at the folds. Care must also be taken that the leather is equally stretched on both sides, otherwise the number of holes on the opposite sides may be unequal. The ends are then cut at an angle of 37 degrees; if cut at a greater angle, the cross-joint will be too short, and if at a smaller, the leather will be wasted. This must however be regulated in some degree by the number of holes in the cross-joint, as the angle must be altered a little if the holes at that part do not fit exactly with the holes along the side.

The different pieces of leather necessary to form one length, or 40 feet of hose, are rivetted together by the ends.

Straps of leather, three inches broad, are then rivetted across the pipe, ten feet apart, to form loops for the purpose of handing or making fast the hose when full of water. The leather is then laid along a table, and a bar of iron, from eight to ten feet long, three inches broad, and one inch thick, with the corners rounded off, is laid above it. The rivets are next put into the holes on one side of the leather, along the whole length of the iron bar. The holes on the other side are then brought over them, and the washers put on the points of the rivets, and struck down with a hollow punch. The points of the rivets are then rivetted down over the washers,

and finished with a setting punch. The bar of iron is drawn along, and the same operation repeated till the length of the hose be finished.

It is necessary, however, to be very particular about the rivets. They should be made of the best drawn copper rods, and, after being forged, chucked in the lathe singly, and the heads turned, after which they must be well tinned before being used. I have tried to get the rivets finished without the extra expense of turning, but I soon found they could never be trusted to. The object of turning being to take off the sharp edges which might otherwise cut the leather, it is quite obvious that this part of the expense is indispensable. I have seen rivets which have been struck in dies ; but on each side of the neck where the dies meet, the sharp edge was invariably left.

The washers are cut with a punch, and afterwards tinned.

Some objections have been made to rivetted hose, on account of the alleged difficulty of repairing them ; but this is not so serious a matter as may at first view appear. Indeed they very seldom require any repairs, and when they do, the process is not difficult. If any of the rivets be damaged, as many must be taken out as will make room for the free admission of the hand. A small flat mandrel being introduced into the hose, the new rivets are put into the leather, and rivetted up the same as new pipe ; the mandrel is then shaken out at the end.

If the leather be damaged, it may be repaired either by cutting out the piece, and making a new

joint, or by rivetting a piece of leather upon the hole.

The manner of attaching the hose to the coupling-joint, is also a matter of very considerable importance. If a joint come off when the engine is in operation, a whole length of hose is rendered useless for the time, and a considerable delay incurred in getting it detached, and another substituted.

To prevent this, the hose ought to fit as tightly as possible to the coupling-joint, without any packing. In rivetted hose, a piece of leather, thinned down to the proper size, should be put on to make up the void, which the thick edge of the leather next the rivet necessarily leaves; the hose should then be tied to the coupling-joint as tightly as a half-inch cord will bear. The cord ought to be made of lint very hardly twisted and cable-laid, that is, nine strands in place of three. The advantage of having the cord made in this manner is, that it better resists the water, and is therefore less liable to contraction and expansion. See plate 4, fig. 4.

When the hose are completely finished in this manner, they are proved by a proving-pump, and, if they stand a pressure of 200 feet of water, they are considered fit for service. I may also add, that, when any piece of hose has been under repair, it is proved in the same manner before it is deemed trust-worthy.

The proving of the hose is of very considerable importance, and the method of doing so which I have mentioned, is greatly superior to the old plan

of proving them on an engine or fire-cock. By the latter method, no certain measure can be obtained by which the pressure can be calculated. In the first place, it must depend on the relative height of the reservoir from whence the water is obtained, and that of the fire-cock where the experiment is made; and as the supply of water drawn from the pipes by the inhabitants, may be different on different days of the week, and even in different hours of the day, it is quite evident, that by this method no certain rule can be formed for the purpose required, the pressure being affected by the quantity of water drawn at the time.

The method of proving by an engine is considerably better than this; but when a proving-pump can be obtained, it is infinitely better than either. One disadvantage of an engine is, that it requires a considerable number of men; but even the proof, that of throwing the water to a given height on the gable of a house, or other height, is not always a test of the sufficiency of the hose. As the temperature is low or high,—the wind fresh or light,—the degree of pressure on the hose, in throwing the water to the required height, will be greater or less. Indeed, in high winds, it is a matter of extreme difficulty to throw the water to any considerable height.

With an engine of 7-inch barrels and 7-inch stroke, fitted with 80 feet of 2½-inch hose, I have found from several experiments, that when the water is thrown 75 feet high, the pressure on the

hose is equal to 100 feet. The same engine, with 160 feet of hose, and the director or jet-pipe, raised 50 feet above the level of the engine, when the water was thrown 56 feet from the director, occasioned a pressure equal to 130 feet on the hose. From these experiments, I am convinced that the pressure will not be equal to 200 feet, except in very extreme cases, or when some obstacle gets into the nozzle of the director.

I tried the extreme strength of a piece of rivetted hose, 4 feet long and $2\frac{3}{4}$ inches diameter, and found that it did not burst till the pressure increased to 500 feet; and when it gave way, the leather was fairly torn along the rivet-holes.

Every possible care should be taken to keep the hose soft and pliable, and to prevent its being affected by mildew. After being used, in order to dry them equally, they should be hung up by the centre, with the two ends hanging down, until half dry. They should then be taken down and rubbed over with a composition of bees'-wax, tallow, neat's-foot oil,* and again hung up to allow the grease to sink into the leather. When the hose appear to be dry, they should be a second time rubbed with the composition, and then coiled up for use. In order that

* This composition, recommended by the Sun-Fire Office in London, has been used here for upwards of four years, and found to answer the purpose well. The proportions are, 1 gallon neat's-foot oil, 2 lbs. tallow, $\frac{1}{4}$ lb. bees'-wax melted together, and laid while warm on the leather.

the hose undergoing the operation of greasing, may not be disturbed, or used till in a fit state, it is better to have a double set, and in this way, while one set is in grease, the other is in the engine ready and fit for service. More time can also be taken for any repairs which may be necessary, and they will, in consequence, be more carefully done; and at fires, where a great length of hose is required, the spare set will always be available. When the weather is damp, and the hose cannot be dried so as to be fit for greasing in two or three days, a stove should be put into the room in order to facilitate the process. The greatest care, however, must be taken in the use of artificial heat. The whole apartment should be kept of one equal temperature, which ought never to be higher than is requisite to dry the hose for greasing in about forty hours.

Coupling-joints.—So much of the efficiency and duration of the hose depend on the proper form given to the brass coupling-joints, that I deem it useful to give a detailed description, both of those generally made use of, and of those adopted by the Edinburgh fire-establishment, and also to point out their various defects and advantages.

Fig. 3, plate 4, is the construction commonly made by engine-makers. Its defects are as follows:—From the form of the furrows and ridges where the leather is tied, it does not hold on well against a force tending to pull the hose off endways; screw-nails are therefore often employed, as at A, to secure the hose on the brass. The points of these

nails always protrude more or less into the inside of the joint, and materially impede the current of water. The mouths of the joints are also turned outwards, and form a shoulder, as at B. The intention of this, is probably to assist in securing the leather in its place, and to prevent the cording from slipping. The effects of it are as follows :—First, from the leather being strained over this projection, it becomes liable to be cut by every accidental injury, and very soon cracks and gives way, when a portion must be cut off and a fresh seizing made ; second, the leather being stretched over the projection, does not fit the other part of the joint, and must be loose or filled up with pieces of leather, or, as is sometimes done, with brown paper ; third, the irregularity of the calibre of the conduit which this shoulder occasions diminishes the performance of the engine.

Fig. 4, plate 4, is the coupling-joint adopted in Edinburgh. The furrows at the tying place are shallow, but their edges present a powerful obstacle to the slipping of the leather. No screw-nails are employed, nor is there any shoulder, as at B ; there is therefore no impediment to, or variation in the velocity of the current, as the calibres of the coupling-joints and of the hose are so nearly uniform. It will be seen also, that, as the cording projects above the leather, this latter can never be injured by falls or rubbing on the ground. The slipping of the outer turns of the cord is easily prevented, by a few bits of copper-wire being first laid under

them, and then turned back and confined by the following turns of the cord.

Another great advantage attending the joints used here, is the manner in which their screws are finished. On examining the figure minutely, it will be observed, that the male-screw ends in a cylinder of the diameter of the *bottom* of its thread, consequently of the diameter of the top of the thread of the female-screw. The effect of this is, that, when the screws are brought together, the cylindric portion serves as a guide to the threads, and the most inexperienced person cannot fail to make them catch fair, at the first trial. The advantage of this in the circumstances attending fires is obvious. The same precaution is observed in the screws of the fire-cocks, and generally in all parts of the apparatus.*

These joints, although requiring three or four turns to close them up, yet as it is only the ring D which requires to be turned, it can easily be done with the hand alone without the use of keys. Although, when the whole length of hose has been jointed, it may be as well to send a man with a pair of wrenches to set the joints firm; this, however, is by no means absolutely necessary; if the joints are kept in proper order, a man can secure them sufficiently with the hand.

There is also a facility in taking turns out of the hose, which no other but a swivel-joint affords.

* This form of joint was introduced by Mr Robison.

By slackening a single turn any twist may be taken out, without undoing the joint or stopping the engine, while, from the number of turns required to close the joints, there is no chance of the screw being by any accident undone. In order to prevent the threads from being easily damaged, they should be of a pretty large size, not more than five or six to the inch. For the same reason also the thread should be a little rounded.

As it sometimes happens that the screws are damaged by falling on the street, or by heavy bodies striking them, whenever the hose have been used, the joints should be tried by a steel gauge-screw, to be kept for that purpose. This ought to be particularly attended to, as, on arriving at a fire, it is rather an awkward time to discover that a joint has been damaged, while the delay thus occasioned may be attended with very serious consequences.

The joints in plate 4, fig. 4, are $2\frac{1}{2}$ of an inch in diameter, which may appear large for an engine of six-inch barrels. They are made of this size, in order that, when the water-mains are large enough to admit them, the fire-cocks may be $2\frac{1}{2}$ inches in diameter. The only disadvantage of the large size of hose is a trifling addition to the weight and expense, as the engine always works more easily with large hose.

Two Rolls of Sheepskin.—These are simply four or five stripes of sheepskin, each about three or four inches broad. When a leak occurs in a length of hose, which cannot be easily replaced at

the time, one or more pieces of sheepskin are wrapt tightly over the leak, and tied firmly with a piece of cord. This is but an indifferent method of mending, but I do not know of any other which can be so readily applied with the same effect. If another length of hose can be substituted for the leaky one, it is better to do so ; but that is not always at hand, nor does it always happen that time can be spared for the purpose.

Two Balls of Cord.—These are used for tying the sheepskin and various other purposes.

Two Lengths of Suction-pipe.—These are generally made of leather sewed tightly over a spiral worm of hoop-iron, about three quarters of an inch broad, a piece of tarred canvass being placed between the worm and the leather. They are usually made from six to eight feet long, with a copper rose screwed on the farther end, to prevent as much as possible any mud or dirt from getting into the engine with the water. It is of advantage to carry two lengths of suction-pipe, as, when one is too short, they can be joined to reach the water ; if one is damaged, the other will still be serviceable.

I would recommend, however, that the suction-pipes be made with the leather rivetted, instead of being sewed. When a sewed suction-pipe becomes dry, the engine does not work well until the expanded threads contract, by being again wetted. The suction-pipes are more troublesome to rivet than the common hose, and are done here in the following manner :—After the joints are fixed on

the spiral worm, and it is covered with the tarred canvass, an iron mandrel longer than the worm is put through it, the edge being rounded to the circle of the inside of the worm. The projecting ends of the mandrel are supported to allow the worm to lie quite clear. One end of the mandrel has a check, that the brass joint may not prevent the worm from lying flat on the mandrel. The leather is then put over the worm, and the rivets being put into one side, a small thin mandrel is laid over the canvass, and the rivets struck down upon it. If the small mandrel be not used, the heads of the rivets are apt to lie unequally on the worm.

Four Wrenches for Coupling-joints.—These are for tightening the coupling-joints, when that cannot be sufficiently done by hand. When the hose are all put together, a man is sent along the whole line, with a pair of wrenches, to tighten such of the coupling-joints as require it. The wrenches are generally made as in plate 4, figs. 7 and 8; the hole at A is made to fit the nob on the coupling-joint, and when used, are placed, one on the nob of the male, and another on the nob of the female-screw, so as to pull them in opposite directions.

Two Directors or Jet-pipes.—These are taper copper tubes, having brass nozles. They are screwed to the end of the hose, and are generally made as in plate 4, fig. 2. The female-screw at A is made to fit the coupling-joints of the hose, and in order to afford greater facility in clearing it out,

the nozzle B is made to screw off at C. The nozzle ought to be cast solid, and great care taken in boring it. A space equal in length to the diameter of the orifice at the outward extremity should be bored cylindrically; the rest should be a continuation of the taper of the inside of the director, which dies away into the part of equal width. When the taper continues to the point, the jet begins to spread sooner than it is found to do, when the nozzle is made in the way I have described. The inside of the nozzle should be polished as fine as possible, and the orifice protected, by being sunk a little within the metal, as in plate 4, fig 9.*

Two Ladders.—These are generally used from six to eight feet long, that length being convenient to strap to the engine. When required longer, they are easily joined together by a piece of cord. They are very useful in many cases, such as getting into windows, crossing walls, chimney-heads, &c.

One Boat-hook.—This is a common boat-hook, of such length as may be most convenient to strap on the shaft of the engine. It is used for pulling down ceilings, and taking out deafening-boards when the fire happens to be between the ceiling and the floor above. It is also used when a strong door is to be broken open. It is placed with the

* The directors used here are much shorter than those commonly employed. They are found equally efficacious, and much easier managed in many situations than the longer ones.

point upon the door, one or two men bearing upon it, while another striking the door, the whole force of the blows is made to fall upon the lock or other fastening, which generally yields without much difficulty.

One Line 50, and another 80 feet long, of two-inch Rope, each with a small Hook at one end.—These are generally used for hoisting the hose into the windows of the house, in which there is a fire, the stairs being sometimes so crowded with people and furniture, that it is difficult to force a passage, and when the pipe is laid in the stair, it is liable to be damaged by people treading on it.

One Chain 80 feet long, with a large double Hook at one end.—This chain is $\frac{3}{16}$ ths of an inch in size, and is used chiefly in ascending to or descending from the building on fire, by the windows, when the stair cannot be resorted to for that purpose. The hook is made as in plate 6, fig. 6; that form being preferred, from its being easily made to stick into the floor, to catch the sole of the window, or to fasten readily to such object as may be at hand. A chain is used instead of a rope, as it is less liable to suffer from lying in the engine, where there must always be a greater or less degree of damp. The communication with the upper floors, too, is more easily preserved by a chain than a rope, the latter being liable to be destroyed by a sudden burst of flame. The chain is wrapped upon a light iron frame, that it may be always in order

when wanted, as it is more liable to get entangled than a rope if left in a loose state.

One Mattock and Shovel.—These are useful in damming any running water or gutter, uncovering drains, &c. from which the engine may be supplied with water. The mattock should be short and strong, and the shovel of the sort called diamond-pointed.

One Hatchet.—The most serviceable hatchet for a fire-engine, is similar to that used by wood-cutters. See plate 6, fig. 7. The back part is made large that it may be conveniently used as a hammer.

One Saw.—This should be a stout cross-cut saw, very widely set. It is useful in cutting off the communication between one house and another, which, when water is scarce, is sometimes necessary.

One iron Crow-bar.—This should be about two feet long. It is used in opening doors, breaking through walls, &c.

One Turn-screw.—This must be made to fit the screws, which fasten the barrels and valve-covers to the cast-iron sole, and is principally used to take down the engine.

One Piece of Sheet-lead.—This should be two feet and a half square, of six or seven lb. to a foot. It is used in covering the eye of a drain, over which it may be necessary to convey a current of water for the supply of the engine. When two or three engines come together, each having a similar piece

of lead, if the inclination of the ground be suitable, a supply of water may in this way be brought from a considerable distance.

One Suction-tub.—This is mounted on a carriage. See plate 7, figs. 3 and 4. In order that the tub may not be in the way of the shafts of the engine when working, it is generally made of an oval shape. It is used only when the engine is supplied by suction, from water conveyed in carts or buckets, and is greatly preferable to any plan of emptying the water directly into the engine. By this latter method there is always a considerable waste of water, arising both from the height of the engine, and the working of the shafts; and, in addition to these objections, only one person can pour in water at a time. When the water is poured into the engine from carts, it must stop working till the cart is emptied. All these objections are in a great measure removed, by placing the suction-tub clear of the engine. Five or six men may be stationed round it, to empty the buckets as they arrive. If water-carts be used, three of them may be emptied at a time without obstructing the working of the engine. The tub, which is frequently used for carrying spare hose, rope, &c., is made to fit exactly to the carriage, which is placed on two light wheels, the whole when empty being easily drawn by one man. The tub and carriage can also be linked to the engine if necessary, by two hooks, which are affixed to the after part of the engine for that purpose.

**DIFFERENT MODES OF SUPPLYING FIRE-ENGINES
WITH WATER.**

Having thus briefly described the different articles attached to each fire-engine, I shall now notice the various modes of supplying them with water.

The best plan for this purpose is that by means of fire-cocks. One or more lengths of hose are screwed on the fire-cock ; the extreme end being put into the engine, the fire-cock is then opened and the water rushes in. When the water-pipes are large and the pressure considerable, two or even three engines may be supplied from the same fire-cock. In this latter case, however, a distributor is necessary ; for description of which see " Fire-cock," page 40.

If the fire-cocks are all at too great a distance from the place on fire, to be reached by the supply of hose brought with the engine, the next resource is, to open the nearest fire-cock above the level of the place where the water is required. By covering the eyes of drains, and stopping up any cross-water channels, the water may in this manner be conveyed along the street, from a very considerable distance. From the nature of the ground it does not always happen that the water will run directly from the nearest fire-cock, to the spot where it is required ; acclivities, buildings, and many other causes, may prevent this ; but in some of these cases a few lengths of the hose attached to the fire-cock, may convey the water to a channel,

which will conduct it to the required point. Upon the arrival of the water, it ought to be dammed up, and the engine will lift it by suction out of the pool so formed.

If, however, from the nature of the ground, from the want of hose, or from other causes, it is found impracticable to convey the water by either of the above methods, the next best is, to conduct the water in hose as far as can be accomplished, and carry it the remainder of the distance in carts, buckets, or whatever else may be most convenient.

When carried in buckets it is of advantage to form a line of men from the water to the engine, each man covering five or six feet of ground. The buckets are then handed from one man to another, till they reach the two or three men who are stationed round the suction-tub or fire-engine to receive them. The buckets when emptied are returned by a different line of men (women or boys) stationed in the same manner as the former. If a sufficient number of hands cannot be had to return the buckets in this manner, any convenient number may be employed to carry them to the fire-cock, that they may be again filled. When a fire occurs where the water-pipes are unprovided with fire-cocks or plugs, the ground should be immediately opened, and the water-pipe cut. If it be of cast-iron, a large hammer may effect the purpose: on the water-pipe being broken, the suction-pipe of the engine is placed in the opening so made. If the pipe be of lead, the opening in the street should

be made of sufficient length to admit of one end of it, when cut, being turned into the engine. If the supply of water by this means be so great as to occasion waste, it may be regulated by the nearest stop-cock on the water-pipe, by driving a wooden plug into the end of a cast-iron pipe, or compressing the end of a leaden one.

The next plan I shall notice of supplying fire-engines is from drains, gutters, &c. In particular situations and wet weather considerable supplies of water from these and similar sources may be obtained. In the gutters all that is required is to dam them up; and, if there be no materials at hand for this purpose, the causeway must be dug up, till there is a sufficient depth of water for the suction-pipe of the engine.

When the water is to be drawn from drains or common-sewers, great care should be taken not to damage them farther than is absolutely necessary.

If enough of cover be taken off to allow one man to enter easily, it will be quite sufficient for all necessary purposes. When the man inside the drain or common-sewer has collected a proper supply of water by damming up the channel, the suction-pipe should be handed down to him, and the engine set to work.

Although it be true that foul water quenches fire, I will here observe, that the water from a common-sewer should never be used, except when it is impossible to procure it from a purer source. For the purpose of procuring water to extinguish a fire,

I had at one time occasion to open a common-sewer, in which, with the usual impurities, the waste from a gas-manufactory was intermixed, and the stench in the premises where the fire had been extinguished by this water, was for some time after very disagreeable.

If the water be obtained from a pond or river at a little distance, one engine may be stationed close to it, and that engine made to pump the water into another at work. If the water be conveyed in carts, an engine may be kept at the pond or river for the purpose of filling them. Of course this can only be done where there is a proper supply of engines.

In working from an open water, such as a gutter, drain, river, or pond, it is proper, in order to prevent sand or gravel being drawn into the engine, to sink an iron or wooden bucket, into which the suction-pipe of the engine should be placed. If nothing better can be had, a good wicker basket will be found useful.

It is of great advantage to have a number of carts, with butts upon them full of water, as it ensures a small supply to the engines the moment they arrive at the fire. This plan, however, entails a very considerable expense, as carters must be paid for taking them out on every alarm, besides giving prizes to the owners of the first and second horses, to ensure their coming in time.

In some situations it may be convenient to bring water by hand-carts, in which case the following construction will be found a good one :—Figs. 1

and 2, plate 7, is a water-cart capable of conveying six cubic feet of water ; it is filled at A and emptied at the exit-pipe B, which is high enough to allow the whole contents to be discharged into the suction-tubs of the engines. The plug which closes the pipe B is moved out and in by a rod which passes through the tank, and of which the handle C is at the end opposite the exit-pipe, so that the person conducting the cart can run it up to the tub, and discharge it without quitting his place between the shafts: the naves of the wheels are of cast iron, and the spokes and fellyes of wood. The tank itself is made of sheet-iron rivetted together, and painted over, after the seams have been allowed to close themselves by rusting.

Fire-cocks.—Having had frequent occasion to speak of fire-cocks, I shall here describe one, with the apparatus belonging to it, as used in Edinburgh.

A B C D E, in plate 6, fig. 1, represents the main or water pipe, on which the fire-cock is to be placed ; B C D is one length of main divided into three pieces ; that division being necessary when the joints are spigot and faucet, as most of those in use here are. When the joints are flanced, however, the piece C is made in one piece of nine feet long. I may here mention, that the reason for this division, where the joints in the main are spigot and faucet, is the facility it affords to the piece C, to which the fire-cock is attached, being removed in the event of its being damaged. If they are not

divided in this manner, three or four of the joints, when the piece is under repair, require to be burned out, (*i. e.* the lead melted out of the joints,) and from twenty-five to thirty feet of the street opened. This not only causes a considerable expense, but, from the length of time required to burn out the joints, the supply of water to the inhabitants, from the pipe undergoing this operation, is for the time interrupted, and the thoroughfare for carriages greatly impeded. There is no avoiding this operation, however, where fire-cocks are to be put on mains previously laid in this way. On the flanch F a piece of cast-iron pipe H, (the length of which is regulated by the depth of the main from the street, or the depth of cover, as it is technically called,) is put, and the fire-cock K is then attached to it, with a screw L at the top, to fit the coupling-joints of the hose ; the space is then built up all round, to within eight inches from the level of the street, with stones without mortar, taking care that no part of the building rests on the main. The cast-iron frame N N N N, (of which a section only is given,) is then laid on the building, and the causeway-stones set firmly round it ; the door having two iron catches at one side, to take hold of the frame, and on the other a copper bolt is let into the notches at the top of the frame. The doors are made and fixed in this manner rather than with hinges, which, on account of their liability to rust, are objectionable ; and for the same reason the bolt of the lock is made of copper rather than of iron. The key for opening the door is made as in

plate 6, fig. 3. There are no wards in the lock, it being so much exposed to the weather. Fig. 4, plate 6, is a picker for opening the door when the bolt has got turned by the shaking of carriages, &c.

When the fire-cock is used for the supply of only one engine, the hose is attached to the top L, the handle M is then raised till it is perpendicular to the street, which opening the cock, the water rushes through the hose into the engine. If the pressure is great, and the main large, opening the cock a half, or even a third, may be sufficient for the supply of one engine. When there is a probability that more than one engine will require to be supplied from the same fire-cock, a distributor is put on, see plate 6, fig. 2.

The female-screw at A fits the screw on the top of the fire-cock L, to which it is attached; one or more of the caps B B B B are then unscrewed, and the hose attached in their places. The fire-cock is then opened, and the water rushes through the hose with a degree of velocity corresponding to the size of and pressure in the main. Most of the distributors are made with only two caps, as it is only in particular situations and on large mains that the fire-cocks are able to supply more than two engines. There are a few in Edinburgh, however, which could easily supply three or even four engines of seven-inch barrels. Some of the smaller fire-cocks on lead pipes are unable to supply one engine of that size.

In attaching one and a half and two-inch fire-cocks to lead pipes, the only difference in the opera-

tion is, that a piece of lead pipe is soldered perpendicularly to the main, of a proper length for the depth of cover. At the upper end a lead flanch is soldered, an iron flanch being first put on the pipe, with a bar of iron at each side; these bars are bolted to a large stone in each side of the building, for the purpose of steadying the cock while the handle is being turned, the lead pipe being unable to stand the strain of opening and shutting the cock without bending. The flanch and screw are exactly the same as in the large cocks.

The opening within the building is filled up with sand or small rubbish to the dotted line O O; and in winter, for the better protection of the cocks from the frost, which, besides rendering them unserviceable for the time, is apt to split them, the remainder of the opening is stuffed with straw to the iron door.

I may here observe, that there are no cast-iron mains in Edinburgh so small as two inches; all the two, and one and a half inch fire-cocks are therefore upon lead mains of these sizes. The fire-cocks on the cast-iron mains are two and a half inches: all of them have round water-ways.

The Edinburgh Water Company do not allow of fire-cocks being attached to their cast-iron mains by means of saddles.*

* The reason of this restriction is, that when the pressure from the fountainhead at Crawley Springs is allowed to act on the water in the main, (from 260 to 540 feet,) accidents might happen from the failure of the straps and fixtures of the saddles.

The buckets used here are made of canvass, sewed up the sides, and nailed with copper nails on a wooden bottom nine inches in diameter, and turned over a tinned iron ring of the same size at the top, to which a moveable iron handle is affixed : the whole bucket folds up in a space nine inches in diameter by three inches thick, the smallness of size being a great advantage when a number require to be carried. Although the canvass has undergone no preparation to make it water-tight, the leakage is almost imperceptible : when extended, the bucket is fourteen inches deep. Some buckets have lately been made entirely of canvass, with a circle of stout rope sewed round their bottoms and mouths, to stiffen them ; the handle is also of rope : they are cheaper, and answer equally well with the others. It is found that less water is spilled in carrying in a canvass bucket, than in a leather one.

Training of Firemen.—I shall now consider one of the most important matters connected with a fire-engine establishment, the training of the firemen.

It is quite obvious that an establishment of this sort, however complete in its apparatus and equipments, must depend for its efficiency on the state of training and discipline of the firemen. Wherever there is inexperience, want of co-operation, or confusion amongst them, the utmost danger is to be apprehended in the event of fire. It is amidst the raging of this destructive element, the terror and bustle of the inhabitants, that organization and discipline triumph, and it is there too that coolness

and promptitude, steadiness and activity, fearlessness and caution, are peculiarly required ; but, unfortunately, it is then also that they are most rarely exhibited.

The description of men from whom I have been in the habit of selecting firemen are slaters, housecarpenters, masons, plumbers, and smiths.

Slaters make good firemen, not so much from their superiority in climbing, going along roofs, &c., although these are great advantages, but from their being in general possessed of a handiness and readiness which I have not been able to discover in the same degree amongst other classes of workmen. It is perhaps not necessary that I should account for this, but it appears to me to arise from their being more dependent on their wits, and more frequently put to their shifts in the execution of their ordinary avocations. Housecarpenters and masons being well acquainted with the construction of buildings, and understanding readily from whence danger is to be apprehended, can judge with tolerable accuracy, from the appearance of a house, where the stair is situated, and how the house is divided inside. Plumbers are also well accustomed to climbing and going along the roofs of houses ; they are useful in working fire-cocks, covering the eyes of drains with lead, and generally in the management of water. Smiths are serviceable in any little matters of repair which may be necessary about the engine or apparatus while at work. Smiths and plumbers can also bet-

ter endure heat and smoke than most other workmen.

Men selected from these five trades are also more robust in body, and better able to endure the extremes of heat, cold, wet, and fatigue, to which firemen are so frequently exposed, than men engaged in more sedentary employments.

I have generally made it a point to select for firemen, young men from seventeen or eighteen to twenty-five years of age. At that age they enter more readily into the spirit of the business, and are much more easily trained, than when farther advanced in life. You will frequently find men who, although they excel in the mechanical parts of their own professions, are yet so devoid of judgment and resources, that when any thing occurs which they have not been taught, or have not been able to foresee, they are completely at a loss. Now it happens not unfrequently that the man who arrives first at a fire, notwithstanding any training or instructions he may have received, is still, from the circumstances of the case, left almost entirely to the direction of his own judgment. It is therefore of immense importance to procure men on whose coolness and judgment you can depend. If they are expert tradesmen, so much the better, as there is generally a degree of respect shown to first-rate tradesmen by their fellows, which inferior hands can seldom obtain; and this respect tends greatly to keep up the character of the corps to which they belong, and which ought never to be lost sight of.

Amidst the noise and confusion which more or less attend all fires, I have found considerable difficulty in being able to convey the necessary orders to the firemen in such a manner as not to be liable to misapprehension. I tried a speaking-trumpet ; but, finding it of no advantage, it was speedily abandoned. It appeared to me indeed, that while it increased the sound of the voice, by the deep tone which it gave, it brought it into greater accordance with the surrounding noise. I tried a boatswain's call, which I have found to answer much better. Its shrill piercing note is so unlike any other sound usually heard at a fire, that it immediately attracts the attention of the firemen. By varying the calls, I have now established a mode of communication not easily misunderstood, and sufficiently precise for the circumstances to which it is adapted, and which I now find to be a very great convenience.

The calls are as follows :—

- 1 for red, 2 for blue, 3 for yellow, 4 for grey.*
- 5 to work the engine.
- 6 to stop working.
- 7 to attach one length of hose more than the engine has at the time the call is given.
- 8 to coil up the hose attached to the engine.
- 9 to coil up the hose attached to the fire-cock.
- 10 turn to the left.

* The engines and their crews are distinguished by these colours.

11 to turn to the right.

12 the call to work the engine, answers also to move forward when the engine is prepared for travelling.

13 the call to stop working, answers to stop the engine when moving forward.

In all there are thirty-six calls when compounded with the first four.

In speaking of the drilling of firemen, I shall give a short account of the plan followed here, which has been tolerably successful.

The present number of firemen in Edinburgh is fifty, divided into four companies; three of which consist of twelve and one of fourteen men. The bounds of the city are divided into four districts; in each of which there is an engine-house, containing one or more engines, one of the companies being attached to each engine-house. In each company there is one captain, one sergeant, four pioneers, and six or eight firemen.

The whole are dressed in blue jackets, canvass trowsers, and hardened leather helmets, having hollow leather crests over the crown to ward off falling materials. See plate 6, fig. 5. The form of this helmet was taken from the war-helmet of the New Zealanders, with the addition of the hind flap of leather. In front, the helmet has a brass plate, and behind there is a projecting flap of leather to prevent burning matter, melted lead, water or rubbish getting into the neck of the wearer. The captains' helmets, besides the brass plate in front,

have three small ornaments, those of the sergeants one, those of the pioneers and firemen being plain.

The jackets of the captains have two small cloth wings on the shoulder, similar to those worn by light infantry. Those of the sergeants have three stripes on the left arm, and, on the left arms of the pioneers and firemen, are their respective numbers in the company. Each company has a particular colour, —red, blue, yellow, and grey. Each engine is painted of one or other of these colours, and the accoutrements of the men belonging to it correspond. There is thus no difficulty, in distinguishing the engines or men from each other, by their colours and numbers. Each man also wears a broad leather waist-belt, with a brass buckle in front. To the waist-belts of the captains, sergeants, and pioneers is attached 80 feet of cord ; the captains having also a small mason's hammer, with a crow-head at the end of the handle : the sergeants have a clawed hammer, such as is used by house-carpenters, with an iron handle, and two openings at the end for unscrewing nuts from bolts ; the pioneers a small hatchet, with a crow-head at the end of the handle ; and the firemen each carry a canvass water-bucket folded up.

The captains assemble every Tuesday night, to give in a report of such fires as may have occurred in their respective districts, with a list of the men who have turned out, and a corresponding list from the sergeant of police of the respective districts. They then receive any orders which may

be necessary ; and any vacancies which have occurred in the establishment, are filled up at these meetings.

For some months after this fire-establishment was organized, the men were regularly drilled once a-week, at four o'clock in the morning ; but now only once a-month at the same hour.

Among many other good reasons for preferring this early hour, I may mention, that it does not interfere with the daily occupation of the firemen. The chance of collecting a crowd is also avoided, as there are then comparatively few people on the streets ; this is a matter of some importance, as a crowd of people not only impedes the movements of the firemen, but, from small quantities of water spilt on the by-standers, quarrels are generated, and a prejudice excited against the corps, to avoid which every exertion should be used to keep the firemen on good terms with the populace.

The mornings too, at this early hour, are dark for more than half the year, and the firemen are thus accustomed to work by torch-light, and sometimes without any light whatever, except the few public lamps which are then burning. And, as most fires happen in the night, the advantage of drilling in the dark must be sufficiently obvious.

The inhabitants have sometimes complained of being disturbed with the noise of the engines at so early an hour ; but when the object has been explained, they have generally submitted, with a good grace, to this slight evil. A different part of the city being always chosen for each successive drill,

the annoyance occasioned to any one district is very trifling and of very unfrequent occurrence.

On the Tuesday evening preceding the drill, the captains are informed when and where the men are to assemble. These orders they communicate to the individual firemen. A point of rendezvous being thus given to the whole body, every man, who is not on the spot at the hour appointed, fully equipped, with his clothes and accoutrements in good order, is subjected to a fine. Arrived on the ground, the men are divided into two parties, each party consisting of two companies, that being the number required to work each large engine, without any assistance from the populace. The whole are then examined as to the condition of their clothing and equipments.

The captains, sergeants, and pioneers of each company, alternately take the duty of directing the engine, attaching the hose, &c., while the whole of each party not engaged in these duties take the levers as firemen. The call is then given to move forward, the men setting off at a quick walking pace, and, on the same call being repeated, they get into a smart trot. When the call to stop is given, with orders to attach one or more lengths of hose to the engine and fire-cock, it is done in the following manner :—No 1 takes out the director, and runs out as far as he thinks the hose ordered to be attached will reach, and there remains ; No 2 takes a length of hose out of the engine, and uncoils it towards No 1 ; and No 3 attaches the hose to the engine. If more than one length is required, No 4

takes out another, couples it to the former length, and then uncoils it. If a third length is wanted, No 3 comes up with it, after having attached the first length to the engine. If more lengths are still wanted, No 2 goes back to the engine for another; Nos 3 and 4 follow, and so on till the requisite length is obtained; No 1 then screws on the director at the farther extremity of the last length.* While Nos 1, 2, 3, and 4 are attaching the hose to the engine, No 5 opens the fire-cock door, screws on the distributor, and attaches the length of hose, which No 6 uncoils; Nos 7 and 8 assist, if more than one length of hose be required. Immediately on the call being given to attach the hose, the sergeant locks the fore-carriage of the engine, and unlocks the levers. The fire-cock being opened by No 5, (who remains by it as long as it is being used,) the sergeant holds the end of the hose which supplies the engine, and at the same time superintends the men who work the levers. The call being given to work the engine, the whole of the men, Nos 1, 2, 3, 4, and 5, the captain and sergeant excepted, work at the levers along with the men of the other company.

* The hose are made up in flat coils, with the male coupling-screw in the centre, and the female on the outside. When a length is to be laid out in any direction, it is set on its edge, and then run out in the required direction,—in this way no turns or twists can ever occur. When the hose is to be taken up, it is uncoupled, and then wound up, beginning at the end farthest from the engine or from the fire-cock, (as the case may be): by this method all the water is pressed out.

Although these operations may appear complicated, they are all completed, and the engine in full play, with three lengths, or 120 feet of hose, in one minute and ten seconds, including the time required for the water to fill the engine so far as to allow it to work.

In order to excite a spirit of emulation, as well as to teach the men dexterity in working the engines, I frequently cause a competition amongst them. They are ordered to attach one or more lengths of hose to each of two engines, and to work them as quickly as possible, the first engine which throws water being considered the winner. They are sometimes also placed at an equal distance from each of two separate fire-cocks; on the call being given to move forward, each party starts for the fire-cock to which it is ordered, and the first which gets into play is of course held to have beat the other. The call to stop is then given, and both parties return to their former station, with their hose coiled up, and every thing in proper travelling order; the first which arrives being understood to have the advantage.

The men are also carefully and regularly practised in taking their hose up common-stairs, drawing them up by ropes on the outside, and generally in accustoming themselves to, and providing against every circumstance, which may be anticipated in the case of fire.

When a fire occurs in a common-stair, the advantages arising from this branch of training are incalculable. The occupants, in some cases amount-

ing to 20 or 30 families, hurrying out with their children and furniture, regardless of every thing except the preservation of their lives and property, and the rush of the crowd to the scene of alarm, form altogether, notwithstanding the exertions of an excellent police, such a scene of confusion as those only who have witnessed it can imagine ; and here it is that discipline and unity of purpose are indispensable ; for, unless each man has already been taught and accustomed to the particular duty expected from him, he only partakes of the general alarm, and adds to the confusion. But even where a hose has been carried up the interior of a common-stair, the risk of damage from the people carrying out their furniture is so great, that the hose is not unfrequently burst, almost as soon as the engine has begun to play. If the hose be carried up to the floor on fire by the outside, the risk of damage is comparatively small ; the hose in that case being only exposed for a short distance in crossing the stair.

Within the last four years, the only two firemen who have lost their lives, were run down by their own engines ; and, in order to avoid danger from this cause, they are frequently accustomed suddenly to stop the engines, when running down the steep streets with which this city abounds. It is a highly-necessary exercise, and is done by wheeling the engine smartly round to the right or left, which has the effect of immediately stopping its course.

There is a branch of training which I introduced amongst the Edinburgh firemen some time ago,

which has been attended with more important advantages than was at first anticipated. I mean the gymnastic exercises. The men are practised in these exercises (in a small gymnasium fitted up for them in the head engine-house) regularly once a week, and in winter sometimes twice: attendance on their part is entirely voluntary; the best gymnasts (if otherwise equally qualified,) are always promoted in cases of vacancy.

So sensible were the Insurance Companies, doing business here, of the advantages likely to arise from the practice of these exercises, that in the autumn of last year they subscribed upwards of £10, which was distributed in medals and money among the most expert and attentive gymnasts of the corps, at a competition in presence of the Magistrates, Commissioners of Police, and Managers of Insurance Companies.

Amongst the many advantages arising from these exercises I shall notice only one or two. The firemen, when at their ordinary employments, as masons, house-carpenters, &c. being accustomed to a particular exercise of certain muscles only, there is very often a degree of stiffness in their general movements, which prevents them from performing their duty as firemen with that ease and celerity which are so necessary and desirable; but the gymnastic exercises, by bringing all the muscles of the body into action, and by aiding the more general development of the frame, tend greatly to remove or overcome this awkwardness. But its greatest advantage is the confidence it gives to the

men when placed in certain situations of danger. A man, for example, in the third or fourth floor of a house on fire, who is uncertain as to his means of escape, in the event of his return by the stair being cut off, will not render any very efficient service in extinguishing the fire; his own safety will be the principal object of his attention, and till that is to a certain extent secured, his exertions are not much to be relied upon. An experienced gymnast, on the other hand, placed in these circumstances, finds himself in comparative security. With a hatchet and eighty feet of cord at his command, and a window near him, he knows there is not much difficulty in getting to the street; and this confidence, not only enables him to go on with his duty with more spirit, but his attention not being abstracted by thoughts of personal danger, he is able to direct it wholly to the circumstances of the fire. He can raise himself on a window-sole, or the top of a wall, if he can only reach it with his hands; and by his hands alone he may sustain himself in situations where other means of support are unattainable, till the arrival of assistance. These are great advantages; but, as I said before, the greatest of all, is that feeling of safety, with which it enables a fireman to proceed with his operations, uncertainty or distraction being the greatest of possible evils. The cord carried at the waist-belt of the captains, sergeants, and pioneers, being fully sufficient to sustain a man's weight, and with the assistance of their small hatchets easily made fast, and the pio-

neers always being two together, there is thus no difficulty in descending even from a height of eighty feet : the cords should be doubled by way of security.

MEANS OF ESCAPE FROM FIRE.

As to the matter of assisting the inhabitants to escape from a house on fire, I do not pretend to say much from experience, as the business has seldom come in my way. When the lower floors of a house are on fire, and the stairs or other ordinary means of retreat destroyed, the simplest and easiest mode of removing the inhabitants from the upper floors, is by a ladder placed against the wall. In order to be able at all times to carry this plan into effect, (as far as possible,) the person having charge of the engines should inform himself where long ladders are to be had, and how they can most easily be removed.

But if a ladder of sufficient length is not to be procured, or is at too great a distance to render it safe to wait for it, recourse must immediately be had to other means.

If it happen that the windows above are all inaccessible, on account of the flames bursting through those below, the firemen should immediately get on the roof, (by means of the adjoining houses,) and descend by the hatch. The hatch, however, being sometimes directly above the stair, is in that case very soon affected by the fire and smoke. If, on approaching, it is found to be so much so, as to ren-

der an entrance in that way impracticable, the firemen should instantly break through the roof, and, descending into the upper floors, extricate those within. If it should happen, however, that the persons in danger are not in the upper floor, and cannot reach it, in consequence of the stair being on fire, the firemen should continue breaking through floor after floor till they reach them. In so desperate a case as this, the shorter process may probably be, to break through the party-wall between the house on fire and that adjoining, when there is one : and when there is no house immediately contiguous, through the gable, taking care in either case to break through at the back of a closet, press, chimney, or other recess, where the wall is thinnest. If an opening has been made from the adjoining house, it should immediately (after having served the purpose for which it was made) be built up with brick or stone, to prevent the fire spreading. All these operations should be performed by slaters, masons, or house-carpenters, who, being better acquainted with such work, are likely to execute it in a shorter time than others ; time, in such a case, being every thing, as a few minutes lost may cost the lives of the whole party. It is not impossible, however, that circumstances may occur to render all or either of these plans impracticable ; in that case, one or two of the lower windows must be darkened, and by this means access gained to the upper ones. The plan recommended by the Parisian firemen is, for a man to wrap him-

self up in a wet blanket, and thus pass swiftly through the flames. But this effort is only to be attempted when the flames from a single door are to be passed ; in any other case the stair will most likely be in flames, and impassable.

Many machines have been constructed for the purpose of facilitating escape from buildings on fire. I have seen a considerable number of these machines, and have heard many others described ; but one or other of two great and insuperable objections applied to most of them,—they were either so unwieldy, that they could not be moved with the necessary celerity, or requiring such a length of time to erect, that the occasion for them was over before they could be used. I remember, in one instance, it was proposed to erect a scaffolding in front of the house from which the people were to be removed ; but unless the house was built of cast-iron, it appeared to me that it must have been burned to the ground, before this unwieldy structure could be brought to the place and erected. As a recommendation of this apparatus, it was stated, that it would be *no more* than two tons weight ! There is one invention, however, to which none of the objections I have stated apply ; that is, to have an iron ring fastened to the window-sole, and inside of the room a cradle, with a coil of rope attached to it. The rope is put through the ring, and the person wishing to escape gets into the cradle, and lowers himself down by passing the rope through his hands. The great objection to this plan, which is certainly

very simple, is the difficulty, or rather impossibility, of persuading people to provide themselves with the necessary materials. Many men, too, are incapable of the exertion upon which the whole plan depends; and if men in a state of terror are unfit for such a task, what is to become of women and children?

Any fire-escape, to be generally useful, must, in the first place, be capable of being carried about without encumbering the fire-engine; and, in the next place, must be of instant and simple application. The means which appear to me to possess these qualifications in the highest degree, is a combination of the cradle plan, with Captain Manby's admirable invention for saving shipwrecked seamen.

The apparatus necessary for this fire-escape is a chain-ladder 80 feet long, a single chain or rope of the same length as the ladder, a canvass bag, a strong steel cross-bow, and a fine cord of the very best workmanship and materials, 130 feet long, with a lead bullet of 3 ounce weight attached to one end, and carefully wound upon a wooden cone 7 inches high and 7 inches broad at the base, turned with a spiral groove, to prevent the cord slipping when wound upon it, also a small pulley with a claw attached to it, and a cord reeved through it of sufficient strength to bear the weight of the ladder.

In order to prevent the sides of the ladder from collapsing, the steps are made of copper or iron tube, fastened by a piece of cord passed through the tube

and into the links of the chain, till the tube is filled. The steps thus fastened are tied to the chain with No 14 copper-wire, so that, in the event of the cord being destroyed, the steps will be retained in their places by the wire. The ladder is provided with two large hooks at one end, (see plate 6, figs. 6 and 8,) for the purpose of fixing it to a roof, window-sole, &c. The bag is of No. 3 canvass, three feet wide, and four feet deep, with cords sewed round the bottom, and meeting at the top, where they are turned over an iron thimble at each side of the mouth of the bag. The steel cross-bow is of the ordinary description, of sufficient strength to throw the lead bullet with the cord attached, 120 feet high.

When the house from which the persons in danger are to be extricated is so situated, that the firemen can get to the roof by passing along the tops of the adjoining houses, they will carry up the chain-ladder with them, and drop it over the window where the inmates show themselves, fastening the hooks at the same time securely in the roof. The firemen will descend by the ladder into the window, and putting the persons to be removed into the bag, lower them down into the street by the single chain. If the flames are issuing from the windows below, the bag, when filled, is easily drawn aside into the window of the adjoining house, by means of a guy or guide-rope.

If the house on fire stand by itself, or if access cannot be had to the roof, by means of the adjoining

houses, the lead bullet, with the cord attached, is thrown over the house by means of the cross-bow ; to this cord a stronger one is attached, and drawn over the house by means of the former ; a single chain is then attached, and drawn over in like manner ; and to this last is attached the chain-ladder, which, on being raised to the roof, the firemen ascend, and proceed as before directed.

If the house be so high that the cord cannot be thrown over far enough to be taken hold of by those on the opposite side, then the persons to be extricated must take hold of the cord, as it hangs past the window at which they may have placed themselves. By means of it they draw up the small pulley, and hook it on the window-sole. The chain-ladder is then made fast to the end of the cord, and drawn up by those below. When the end of the chain-ladder comes to the sole of the window, the persons inside fasten the hooks of the ladder on its sole, or to the post of a bed, the bars of a grate, or any thing likely to afford a sufficient hold. After having ascertained that the ladder is properly fixed, the firemen will ascend and proceed as in the former cases.

I must here remark, that before this plan can be properly put in execution, the firemen must be regularly trained to the exercise. When the firemen here are practised with the fire-escape, the man ascending or descending has a strong belt round his middle, to which another chain is fastened, and held by a man stationed at the window for that purpose ;

if any accident, therefore, were to occur with the chain-ladder, the man cannot fall to the ground, but would be swung by the chain attached to the belt round his body. The men are also frequently practised in ascending and descending by single chains. The firemen here are very fond of the above exercise,—the bagging each other seems to amuse them exceedingly.*

The last resort, in desperate cases, is to leap from the window. When this is to be attempted, mattresses, beds, straw, or other soft substances, should be collected under the window, a piece of carpet or other strong cloth should be held up, by 10 or 12 stout men. The person in the window may then leap, as nearly as possible, into the centre of the cloth. If they have sufficient resolution to take a fair leap, they may escape with comparatively little injury. If they hesitate, and fall from the window instead of leaping, the chance is that they may alight on their head; and in that case there is a danger of injuring the neck.

* In practising this exercise the men are in the habit of descending by the chains from the parapet of the North Bridge here, to the ground below, a height of 75 feet.

CAUSES OF FIRE, AND MEANS OF PREVENTING THEM.

As almost all fires arise from carelessness in one shape or another, it is of the utmost importance that every master of a family should persevere in rigidly enjoining, and enforcing on those under him, the necessity of observing the utmost possible care, in preventing such calamities, which, in nineteen cases out of twenty, are the result of remissness or inattention. Indeed, if any one will for a moment consider the fearful risk of life and property, which is often incurred from a very slight inattention, the necessity of vigilance and care will at once be apparent. The most immense hazard is frequently incurred for the most trifling indulgences, and much property is annually destroyed, and valuable lives often lost, because a few thoughtless individuals cannot deny themselves the gratification of reading in bed with a candle beside them. It may suit such people well enough to say, "Let the house burn, my property is insured;" but do such persons ever consider, that when fire has consumed their property, or, rather, what is *not* theirs, but the property of the individuals by whom it is insured, do they consider that the fire will not stop at their bidding, and that it may be beyond the power of any human being to say, "Thus far shalt thou come and no farther?"

In most cases of fire the people in whose premises it occurs, are thrown into what may be called

a state of temporary derangement, and seem to be actuated only by a desire of muscular movement, no matter to what purpose their exertions are directed. Persons may often be seen toiling like galley-slaves at operations which a moment's reflection would show were utterly useless. I have seen tables, chairs, and every article of furniture that would pass through a window, three or four stories high, dashed into the street, even when the fire had hardly touched the tenement. On one occasion I saw crockery-ware thrown from a window on the third floor.*

Most of these extravagancies take place on the first alarm. When the engines have got fairly into play, people begin to recollect themselves, and it is at this time that most of those who "go to see a fire" arrive. By the exertions of the police there is then generally a considerable degree of order restored, and the most interesting part of the scene is over.

What remains, however, may, from its novelty or grandeur, (if the fire is extensive,) be still worth looking at for a little, but much of the excitement is banished with the confusion; and if the fire and firemen seem to be well matched, the chief interest

* At a fire which took place in one of the best streets in Edinburgh, and which began in the roof, the persons who rushed into the house on the first alarm being given, threw the greater part of the contents of the drawing-room and library, with several basketsful of china and glass, out of the windows; the fire injured nothing below the uppermost story.

which is excited in the spectators, is to ascertain which of the parties is likely to be victorious. Few people, comparatively, have thus an opportunity of witnessing the terror and distraction occasioned by the first alarm of fire, and this may probably account for the apathy and indifference with which people who have not seen this regard it.

One of the prevailing causes of fire is to be traced to persons locking their doors, and leaving their houses to the care of children. I believe one-half of the children whose deaths are occasioned by accident suffer from this cause alone: indeed, almost every week the newspapers contain some melancholy confirmation of what I have here stated. Intoxication is also a disgraceful and frequent cause of fire. The number of persons burned to death in this way is really incredible. It is true, that it does not always happen that a fire takes place in the house, in either of the above cases, although the unfortunate beings whose clothes take fire rarely escape with their lives; but the danger to the neighbourhood is at all times considerable, if persons in a state of inebriety are left in a house alone. When there is reason to apprehend that any member of a family will come home at night in that state, some one should always be appointed to receive him, and on no account to leave him till he is put to bed, and the light extinguished.

I do not mean to say that people must be actually drunk, before danger is to be apprehended from them. Indeed, a very slight degree of inebriety is

dangerous, as it always tends to blunt the perception, and to make a person careless and indifferent. I may also add, that no inconsiderable number of fires are occasioned by the thoughtless practice of throwing spirits into the fire.

Another very general cause of fire is that of approaching with lighted candles too near bed or window curtains; these, being generally quite dry, are, from the way in which they are hung, easily set on fire, and, as the flames ascend rapidly, when once touched, they are in a blaze in a moment.

It is really astonishing to find that, with daily examples before their eyes, people should persist (whether insured or not seems to make little difference) in practices which, there is a hundred chances to one, may involve both themselves and the neighbourhood in one common ruin. Of this sort are the practices of going under a bed with a lighted candle, and placing a screen full of clothes too near the fire. From these two causes alone, there is in Edinburgh an average of one fire in the month.

Houses not unfrequently take fire from cinders falling between the joints of the outer and inner hearths. When smoke is observed to arise from the floor, the cause should be immediately ascertained, and the inmates ought on no account to retire to rest while there is the slightest smell of fire, or any grounds to suspect danger from that cause.

I may here remark, that accidents of this nature are sometimes occasioned by a very absurd method

of extinguishing, at night, the fires kept in grates during the day. Instead of arranging the embers in the grate in such a way as to prevent their falling off, and thus allowing the fire to die out in its proper place, they are frequently taken off and laid on the hearth, where the wood-work underneath it becomes scorched, and the slightest spark falling through a joint in the stones sets it on fire.

I believe some hearths are now made in one stone, which is much safer.

A very frequent cause of fire in shops and warehouses arises from the carelessness of the person intrusted to lock them up. It is no uncommon practice with those to whom this duty is intrusted to light themselves out, or to search for any little article which may have been mislaid, with a lighted paper, and then to throw it carelessly on the floor, imagining they have taken every necessary precaution merely by setting their foot upon it, forgetting that the current of air occasioned by shutting the door frequently rekindles it, and produces the most serious consequences.

In warehouses and manufactories, fires are not unfrequently caused by the workmen being occasionally kept late at work. By the time their task is finished, the men are so tired and sleepy, that the extinguishing of fires and lights is done in a very careless manner. I recollect an instance of this sort, in which the flames were issuing from three upper windows, and observed by the neighbours,

while the workmen, busily engaged at their employment in the lower floors, knew nothing of the destruction that was going on above.

Another never-failing source of this calamity is foul chimneys. It has often been matter of wonder why the fines for this piece of very culpable parsimony or carelessness should be so trifling. I am quite aware it is alleged, that high fines have a tendency to make people conceal this circumstance when it occurs; but if persons sent to extinguish them were to put an iron plate or other cover on the top of the chimney on fire, the smoke would descend into the house, and immediately prove who was in fault. One cause of danger from foul chimneys arises from the communication which they often have with each other in one gable. The divisions or partitions, technically called "briggs," being very often found in a damaged state, the fire communicates to the adjoining chimney, and in this way sometimes wraps a whole tenement in flames. I know a division of a principal street in Edinburgh, in which there is scarcely a single chimney-head that is not more or less in this condition; and I have no doubt that this is not an uncommon case. It is proper to observe here, that this evil is not unfrequently occasioned by pouring water down the chimney while hot; the water acting on the heated stones or "briggs," and making them fly at once into shivers. There is also great danger from the ends of joists, safe-lintels, or other pieces of timber, being allowed to protrude

into chimneys. In one instance, which came under my notice, a vent passing under the recess of a window, had on the upper side no other covering than the wood of the floor ; of course, when the chimney took fire, the floor was immediately in a blaze : but there are many instances of such carelessness. It is a common practice amongst carpenters to drive dooks (small pieces of wood) into walls for the purpose of fixing wall-straps, grounds, &c., not paying the least attention as to whether the points run into the vents or not.

In the repairs and alterations of old buildings, house-carpenters are, if possible, even more careless in this particular, than in the construction of new.

I know of two different buildings, both within one hundred yards of where I now write, which have recently undergone some alterations. In both of these, safe-lintels had been run into vents, and both of them have since the alterations taken fire ; the one in consequence of a foul chimney, which set fire to the lintel ; and, although the other did not take fire from the same cause, the lintel was nevertheless very much scorched, and obliged to be removed.

Great carelessness is frequently exhibited by builders, when erecting at one time two or three houses connected by mutual gables, by not carrying up the gables or party-walls with a skew on the outside, so as to divide the roofs. I have seen more than one instance where the adjoining house would have been quite safe but for this culpable neglect.

It is no uncommon thing, too, to find houses divided only by lath and standard partitions, without a single brick in them. When a fire occurs in a house divided in this manner, the vacuities in the middle of the partitions act like so many funnels to conduct the flame, thereby greatly adding to the danger from the fire, and infinitely increasing the difficulty of extinguishing it.

In theatres, that part of the house which includes the stage and scenery should be carefully divided from that where the audience assembles. I do not know if this is done in the more recently built theatres, but I have somewhere seen a plan for a house of this description, in which there is a solid wall carried *up to and through the roof*, and finished with a skew on the outside. The opening in the wall for the stage was arched over, and the other communications secured with iron doors, which were to be constantly kept shut while the audience was in the house. By this plan, or some similar one, there would be abundance of time for the audience to retire, before fire could reach that part of the house which they occupy.

The subject of fire-proof buildings might occupy a considerable space. Where the floors are arched with brick, which is a very common practice, particular care should be taken, that the walls be strong enough to bear the extra pressure thrown upon them by the arches. If the side-walls have not been built strong enough, when they get heated the whole mass gives way, bringing not only de-

struction on the property, but certain death to every individual within the walls. In the fall of a common roof or floor, the rafters or joists generally come down in the centre, and lying in a slanting position, there is a considerable chance of escape, by taking shelter in the windows or close to the wall, where a man may be tolerably safe for a short time; but in the other case, every crevice is filled up by the falling bricks or stones.

To make a building fire-proof, the stairs must be of stone, and the doors of iron, otherwise the arched floors are of no use. Yet strange as it may seem, I have sometimes seen these precautions neglected.

There is a particular description of floor, which, although not altogether fire-proof, is certainly, (at least so far as I can judge,) almost practically so. It is composed simply of plank $2\frac{1}{2}$ or 3 inches thick, so closely joined and so nicely fitted to the walls, as to be completely air-tight. Its thickness and its property of being air-tight, will be easily observed to be its only causes of safety. Although the apartment be on fire, yet the time required to burn through the floor above or below will be so great, that the property may be removed from the other floors, or, more probably, if the means of extinguishing fire be at hand, it may be subdued before it can spread to any other apartment. The doors must, of course, be made in proportion, and the partitions of brick or stone.

When the fires and lights of a house have all been carefully disposed of, the next thing to be consider-

ed is a supply of water. In the country, or where there are no water-pipes or engines, this ought to be particularly attended to. Where no water is kept solely for the purpose of extinguishing fire, such vessels as can be spared should be regularly filled every night, and placed in such situations as may be most convenient in case of danger; and no master of a family ought to retire to rest without being satisfied that this has been attended to. If it had no other advantage than merely that of directing the inmates of a house to the possibility of such an occurrence as fire, it would be worth much more than the trouble such an arrangement would cost; but, in addition to that, a supply of water would be at hand, in most cases, more than sufficient to extinguish the fire immediately on its being discovered, and before it had become either alarming or dangerous. But when no such precaution has been adopted, when even the bare possibility of fire has not been considered, when no attention has even been paid to the subject, and no provision made for it; the inhabitants are generally so alarmed and confused, that the danger is probably over, by their property being burned to the ground, before they can sufficiently recollect themselves to lend any effective assistance.

When a fire actually takes place, every one should endeavour to be as cool and collected as possible; screams, cries, and other exhibitions of terror, while utterly useless in themselves, have generally the effect of alarming those whose services might other-

wise be of the utmost advantage, and of rendering them unfit for useful exertion. It is unhappily too at the commencement of fires that this tendency to confusion and terror is the strongest, when a bucket of water, properly applied, is generally of more value than a hundred will be half an hour afterwards. It is the feeling of total surprise on the breaking out of a fire, which thus unhinges the faculties of many individuals. They have never made the case their own, nay, one would almost imagine, they had scarcely thought such an occurrence possible, till, coming on them almost like a thunderbolt, they are lost in perplexity and terror. The only preventive against this is, to think the matter over frequently and carefully before it occurs.

The moment it is ascertained that fire has actually taken place, notice should be sent to the nearest station where there is a fire-engine. No matter whether the inmates are likely to be able to extinguish the fire themselves,—this should never be trusted to if more efficient help can be had. It is much better that an engine should be turned out twenty times when it is not wanted, than be once too late. This may cause a trifling expense; but even that expense is not altogether lost, as it teaches the firemen steadiness and coolness. Indeed, I have often observed how much more coolly and regularly the firemen here turn out, if called two or three times in a week, than if required only so often in a month.

The person in the house best qualified for such duty should endeavour to ascertain with as much

precision as possible, the extent and position of the fire, while the others collect as much water as they can. If the fire be in an upper floor, the inmates should be got out immediately, although the lower part of the house may generally be entered with safety for some time. If in the lower part of the house, after the inmates have been removed, great care should be observed in going into any of the upper floors, as the flames very often reach the stair before being observed by those above. The upper floors are, besides, generally filled with smoke, and, in that case, there is great danger of suffocation to those who may enter.

This, indeed, is the principal danger attending fires, and should be particularly guarded against, as a person, when being suffocated, is unable to call for assistance. I recollect a case of this kind which occurred here in a house in the Lawnmarket. The fire took place in the third floor from the street, and all the inmates immediately left the premises except one old woman. In about fifteen minutes after the arrival of the engines, the firemen made their way up stairs, and the poor woman was found dead beside a basket partly filled with clothes, which it was supposed she had been packing up for removal; had she made any noise, or even broke a pane of glass, she would in all probability have been saved; as the fire never touched the floor in which she was found, she must have died entirely from suffocation, which a little fresh air would have prevented. Had the slightest suspicion existed that

any one was in the upper floors, they would have been entered by the windows or the roof; but as the fire took place in daylight, and none of the neighbours spoke of any one being in the house, it was thought unnecessary to damage the property, or risk the lives of the firemen, without some adequate cause. This, however, shows how little dependence can be placed on information received from the inmates of the premises on fire. Some of the people who lived on the same floor with this poor woman, and who had seen her immediately before they left the house, never mentioned her. I do not suppose that this negligence arose from apathy, or any feeling of that sort; but the people were in such a state of utter confusion, that they were unable to think of any thing. But to return:—

If any one get up stairs, he should shut all the doors and windows as close as possible, which greatly retards the progress of the flames, and, consequently, gives more time for any after exertions in extinguishing them. If the person who has examined the fire finds a risk of its gaining ground upon him, he should, if within reach of fire-engines, keep every thing close, and await their arrival, instead of admitting air to the fire by ineffectual efforts to oppose it with inadequate means. In the meantime, however, he should examine where a supply of water is most likely to be obtained, and communicate that, and any other local information, to the firemen on their coming forward. If there be no fire-engine within reach, the person who has ex-

amined the fire should keep the place where it is situated as close as possible, till as many buckets of water as can be easily collected are placed within his reach.

Taking care always that there is some one ready to assist him, he should then open the door, and creep forward on his hands and knees till he gets as near the fire as possible, holding his breath, and, standing up for a moment to give the water a proper direction, he should throw it with force, and instantly get down to his former position, where he will be again able to breathe; the people behind handing forward another bucket of water, he repeats the operation till the fire is quenched, or until he feels exhausted; in which case some one should take his place. If there be enough of water, however, two, three, or any convenient number of people may be employed in throwing it; on the contrary, if the supply of water be insufficient to employ even one person, the door should be kept shut, while the water is being brought, and the air excluded as much as possible, as the fire burns exactly in proportion to the quantity of air which it receives.

One great evil, and which ought to be strictly guarded against by people not accustomed to fire, is, that on the first alarm they exert themselves to the very utmost of their strength. This, of course, can last but a short time; and when they feel tired, which in that case soon happens, they very often

give up altogether. Now this is the reverse of what it ought to be. In extinguishing fires, like most other things, a cool judgment and steady perseverance are far more effective than any desultory exertions which can be made.

The heat generally increases in a considerable degree when water is first thrown upon a fire, from the conversion of a portion of it into steam. This is sometimes very annoying ; so much so, that the persons engaged in throwing the water, frequently feel themselves obliged to give back a little. They should on no account, however, abate or discontinue their exertions in throwing the water with as much force as possible in the direction of the fire ; it will in a short time cool the air and materials, and the steam will in consequence be generated more slowly, while a steady perseverance on the part of those employed can alone effect the object in view.

When water is scarce, mud, cow or horse dung, damp earth, &c., may be used as substitutes ; but if there seems no chance of succeeding by any of these, and the fire is likely to extend to other buildings, the communication should be immediately cut off by pulling down the building next to that on fire. Any operation of this sort, however, should be begun at a sufficient distance from the fire to allow the communication to be completely cut off before it gains upon the workmen. If this operation be attempted so near the fire as to be interrupted by it, it must be begun again at a greater distance ; and,

in that case there is a greater destruction of property than might have been necessary.

If a fire occur in a stable or cow-house, surrounded with other buildings of the same description, or with the produce of a farm, there is much danger. The cattle and horses should be immediately removed; and, in doing so, if any of them become restive, they should be blindfolded, taking care that it is done thoroughly, as any attempt to blindfold them partially, only increases the evil. They should be handled as much as possible in the ordinary manner, and with great coolness; the violent gestures and excited appearance of the persons removing them tending greatly to startle the animals, and render them unmanageable.

Where fire-engines are kept, they ought to be tried at least once a-month.

There should not be less than five or six men attached to each engine, who should be properly instructed, and drilled to act as captains, sergeants, and pioneers, to take charge of the engine, and to guide the people who work at the levers. Great care should be taken that the engines are not damaged by the almost ungovernable fury with which the populace sometimes work for the first ten or fifteen minutes. I have, on more than one occasion, seen engines of the best and most substantial construction, rendered nearly useless for the time by the first or second stroke. This violent exertion, instead of serving any good purpose, does more harm than the mere chance of damaging the en-

gines. Persons who have exerted themselves in this way, go home and descant to their neighbours on the fearful toil they have undergone, and the violent colds they have caught from their exertions, and thus raise a prejudice in the minds of others against rendering assistance on similar occasions.

The person having the principal charge of the engines should frequently turn over in his mind what might be the best plan, in such and such circumstances, supposing a fire to take place. By frequently ruminating on the subject, he will find himself, when suddenly turned out of bed at night, much more fit for his task than if he had never considered the matter at all. Indeed he will frequently be surprised when, examining the premises afterwards, (*which he ought always to do, and mark any mistakes he may have committed,*) that he should have adopted the very best mode of extinguishing the fire, amid the noise, confusion, and the innumerable advices showered down on him, by all those who consider themselves qualified or entitled to give advice in such matters; a number, by the way, which sometimes includes no inconsiderable portion of the spectators. He should also make himself well acquainted with the different parts of the town in which he may be appointed to act, and notice the declivities of the different streets, &c. He will find this knowledge of great advantage.

Any buildings, supposed to be particularly dangerous, should be carefully examined, and all the

different places where supplies of water can be obtained for them, noticed.

A knowledge of the locality thus obtained will be found of great advantage in case of a fire breaking out. Indeed all firemen, especially those having the charge of engines, should be instructed carefully to examine, and make themselves acquainted with the localities of their neighbourhood or district. Such knowledge will often prove valuable in emergencies; the proprietors or tenants of the property on fire being sometimes in such a state of alarm, that no distinct intelligence can be got from them.

When an engine is brought to a fire, it ought to be placed as nearly as possible in a straight line between the supply of water and the premises on fire; taking care, however, to keep at such a distance from the latter that the men who work the pumps may be in no danger from being scorched by the heat, or of being annoyed by the falling of water or burning materials. Running the engine close upon the fire serves no good purpose, except to shorten the quantity of hose that would otherwise be required. The addition of twenty or thirty feet of hose makes very little difference in the working of the engine, and, when compared with the disadvantage of the men becoming unsteady from the idea of personal danger, is not even to be named. Indeed, if the engine be brought too near the fire, there is danger of the men quitting the levers altogether. I may also add, that,

both for the safety of the hose and the convenience of the inhabitants, the engine should be kept out of the way of people removing furniture.

When the hose is attached and the engine filled with water, the man who holds the director, accompanied by another, should get so near the fire, inside the house, *that the water from the director may strike the burning materials*. If he cannot accomplish this standing, he must get down on his hands and knees, and creep forward, those behind handing up the hose. A stratum of fresh air is almost always to be depended on from six to twelve inches from the floor, so that if the air be not respirable to a person standing upright, he should instantly get down. I have often observed this fact, which indeed is well known; but I once saw an example of it which appeared to me to be so striking, that I shall here relate it. A fire had broken out in the third floor of a house, and, when I reached the top of the stair, the smoke was rolling in thick heavy masses, which prevented me from seeing six inches before me. I immediately got down on the floor; above which, for a space of about eight inches, the air seemed to be remarkably clear and bright. I could distinctly see the feet of the tables and other furniture in the apartment; the flames in this space burning as vivid and distinct as the flame of a candle, while all above, the smoke was so thick, that the eye could not penetrate it. The fire had already burst through three out of five windows in the apart-

ment, yet, when lying flat on the floor, no inconvenience was felt except from the heat.

When the fire has broken through a floor, the supply of air along that floor is not to be depended on,—the fire drawing the principal supply of air from the apartments below.

When the two first firemen have gained a favourable position, they should keep it as long as they are able; and when they feel exhausted the men behind them should take their place.

The great point to which every thing ought to be made subservient is, *that the water on its discharge from the director should actually strike the burning materials.* This cannot be too often or too anxiously inculcated on every one connected with a fire-engine establishment. Every other method, not having this for its grand object, will, in nine cases out of ten, utterly fail; and upon the degree of attention paid to this point depends almost entirely the question, as to the amount of damage the fire will occasion.

When approaching a fire, it should always be done by the door, if possible. When this is attended to, it is much easier to shift the hose from one apartment to another; and the current of fresh air, entering by the door, and proceeding along the passages, makes respiration easier and safer than elsewhere.

When entrance by the door is impracticable, and access is to be gained by a window, the flames frequently burst through in such a manner as to ren-

der advance in the first instance impossible. In that case, the director should be pointed against the window, nearly in a perpendicular direction; the water striking the lintel, and falling all round inside the window, will soon extinguish the fire at that point, sufficiently to render an entrance practicable.

The old plan of standing with the director in the street, and throwing the water into the windows, is a very random way of going to work; and for my own part, although I have seen it repeatedly tried, I never saw it attended with success. Indeed it is hardly to be expected, that water, thrown from the street into a room, three or four storeys high, can have any impression on closets, presses, or passages, divided probably with brick partitions in the centre of the house. The circumstance of having engines at work on both sides of the house does not alter the case. The fire very often burns up through the centre, and frequently, when the space between the windows is large, along the front or back-wall, till it arrives at the roof, which the water cannot touch on account of the slates or tiles. On the other hand, when the firemen enter the house, the fire is almost wholly under their command. And when it happens that there is any corner which the water cannot directly strike, the fire in it may often be extinguished by throwing the water against an opposite wall or partition, and trusting to the recoil to throw it to the point required.

When the water is thrown from the street, it is impossible to say whether it touches the parts on fire or not. No one can tell any thing about it, except when the flame appears at the windows.

On going with the director inside the house, besides the advantage of the water rushing directly from the hose upon the fire, there is a great saving in the article of water itself. The whole that is thrown by the engine is applied to the right purpose. No part of it is lost; that which does not strike the burning materials falls within the house; and, by soaking those parts on which it falls, prevents their burning so rapidly when the flames approach them.

If, on entering an apartment, it be found that the flames cover a considerable space, it is of advantage, in some instances, to place the point of the thumb in contact with the water at the nozzle of the director. By this means the water may be spread to cover any space under twenty or thirty feet, according to the pressure applied.

While speaking of the mode of entering houses on fire, I shall notice some inventions which have been tried here for the purpose of elevating the director and hose to the level of a second or third storey window. Before describing these, I may be allowed to state, however, that, although these inventions may be exceedingly ingenious, their claims to be considered useful, appear to me to rest on a principle entirely wrong. I mean that of throwing water on the fire from the outside of the building;

but, as these machines have attracted considerable notice, I deem it right to mention them.

The sketch in fig. 1, plate 8, is a triangle composed of three ladders, each 25 feet long. When it is to be used, the hexagonal-shaped stage or platform of wood marked A is laid on the ground, and the ladders attached to it by means of bolts, which act as pins to so many hinges. The centre piece A is then raised up, and the ladders drawn together and fastened at the bottom by the iron stretchers B C D. The firemen then ascend, and direct the water from the platform A. The ladders may be used singly when the triangle is not required. The invention is by a tradesman in Leith.

Fig. 2, plate 8, is the sketch of a triangle invented by a Mr Shiels, a confectioner in this city. When used, the leg D E (40 feet long) is laid upon a trestle at A; the other legs A D and A C are laid in an opposite direction, all the three meeting at A; a bolt is then put through them, and a cross yard F G is fixed on the leg E D; the director I H is then fixed in a swivel iron socket at H; a cord, attached to the point of the director, is passed through an iron ring at F and another at G; the iron pins at D and C are then driven into the ground to prevent the two legs A B and B C from slipping, while the foot D of the leg D H is pushed forward until the director is raised to the required height. When raised, the director is drawn to the right or left by the cords at G and F, the cord K serving to depress the point of the director, the

weight of the leather hose serving to raise it when the cord K is slackened.

The apparatus in fig. 3, plate 8, is the invention of a Mr Brown, an architect here, and seems to be superior to the other two. The sole A B is composed of two pieces of plank, fixed about five inches apart from each other. The short upright C D is half the length of the sole, and is hinged by a bolt at D. When the pole H G is to be erected, the upright C D is brought to a perpendicular position, and fixed there by the ladder G B and the two supports C E and C F; the end of the pole G H is then carried up the ladder and passed through the two rings of the moveable joint I, until the portion passed through is equal to the length of the short upright C D. The end G of the pole G H is then weighed down to D, and there fixed. The director is next attached to the slide M M; which slide is elevated by a cord passing through a pulley at H. The point of the director is depressed by another cord O. P is an iron handle, which serves to turn the whole pole H G, and along with it the director. To the handle P is affixed the cord which elevates the director; and by turning the handle a considerable power is given for this purpose. When the street is too narrow to admit of the supports C E and C F being extended, a stretcher is used, which is fixed at C, and can be lengthened or shortened at pleasure, so as to support the pole against the sides of the houses. Again, when the street is not level, the ladder C B

can be moved along the sole A B, until the pole stands in a perpendicular position. One advantage which this machine possesses over the other two is, that by it the director may be elevated or lowered to any point between I and H.

Independent altogether of a mistaken principle of usefulness, one insuperable objection to all these machines, is, the difficulty of conveying them with the necessary celerity, and the impossibility of packing them on the engine in such a manner that it may be worked without their being taken off, as it seems to me *that every description of apparatus which cannot be conveyed along with the engine, is likely to be left behind when most wanted.* It is notorious, that parish fire-ladders are, for this reason, seldom or never made use of.

Many people object to going inside a building on fire on account of the danger. It ought never to be forgotten, however, that the danger increases with the delay; and that although at first there may be no danger, if the opportunity is not promptly seized, it may become very considerable.

In Edinburgh, where the invariable practice is to enter the building on fire at all hazards, there has, during the last four years, been but one serious accident in consequence; this was occasioned by the falling of a stone stair, by which one of the men had two or three of his ribs broken. Several of the men have at different times fainted, or become stupified, from the want of fresh air; but as no one is ever allowed to enter singly, they have been,

in all cases, immediately observed by their comrades, and relieved.

Another objection has been raised in the alleged difficulty of persuading men to risk their lives in this manner, for the small consideration which is allowed them. The truth is, that any persuasions I have had occasion to use, have been generally on the other side.

To hold the director is considered the post of honour; and when two engines are working together, I have sometimes difficulty in preventing the men from pressing forward farther than is absolutely necessary. This forwardness is not the result of pecuniary reward for the increase of risk, the pioneers having only five shillings a quarter more than the men who work at the levers of the engines; but a spirit of emulation is at work, and the man intrusted with this branch of duty, if found drawing back, would be completely disgraced.

I do not recollect a single instance, during the last four years, of the firemen being obliged to retreat after having once gained a position inside. They generally, for a few minutes after having first entered, withdraw for a little on account of the steam, but seldom longer than three or four minutes.

A retreat, however, should in all cases be kept open, to provide against any accident that may occur; and as this may be done in almost all cases by means so easy and simple, there can be no excuse for its omission. If the fire is above the street-floor, a single chain hung over the window will be

quite enough for an expert fireman ; and none other should be permitted to enter where there is personal danger.

The danger to which firemen are most exposed is catching cold, from their being so frequently drenched with water, and from their exposure to the sudden alternations of heat and cold. A man is turned out of bed at midnight, and in a few minutes after quitting it he is exposed to the sharp air, perhaps, of a frosty winter night ; running to the fire as fast as he can, he is, from the exercise, joined to the oppressive heat inside the place on fire, in a few minutes in a state of the most profuse perspiration ; and, while in this state, he is almost certain to be soaked with cold water. The smoke is sometimes so thick, that he comes under the range of the director of the engine, without being aware of it till the water strikes him. If he escape this chance, the water rushing on some other object, recoils on him, and produces the same effect ; and if the fire be in the roof of the apartment, he must lie down on his back on the floor, and in this manner gets completely steeped.

A bath of this sort is neither very safe nor pleasant ; and the only preventive of injury to the health is to keep the men in constant motion. When they are allowed to stand still or sit down, the danger is considerable. When the fire is extinguished, or in two or three hours after its commencement, I make it a rule to give every man a dram of spirits. If it be necessary to leave an en-

gine on the spot, those of the men who are to remain, are sent home to change their clothes; the captains, sergeants, and pioneers, being each provided with two jackets and two pairs of trowsers. I have only known of one man, within the last four years, who died of cold caught in this way.

GENERAL REMARKS.

It is now pretty generally admitted, that the whole force brought together for the extinguishing of a fire ought to be under the direction and control of one individual. By this means, all quarrelling among the firemen about the supply of water, the interest of particular insurance companies, and other matters of detail, is avoided. By having the whole force under the command of one person, he is enabled to form one general plan of operations, to which the whole body is subservient; and although he may not, in the hurry of the moment, at all times adopt what will afterwards appear to be the best plan, yet it is better to have some general arrangement, than to allow the firemen of each engine to work according to their own fancy, and that, too, very often in utter disregard whether their exertions may aid or retard those of their neighbours. The individual appointed to such a situation ought not to be interfered with, or have his attention distracted, except by the chief authority on the spot, or the owner of the premises on fire. Much valuable in-



formation is frequently obtained from the latter, as to the division of the premises, the party-walls, and other matters connected with its locality. But, generally speaking, the less interference and advice the better, as it occupies time which may generally be better employed.

I need scarcely add, that on no account whatever should directions be given to the firemen by any other individual while the master of the fire-engines is present; and that there may be no quarrelling about superiority, the men should be aware on whom the command is to devolve in his absence.

It has often been to me a matter of surprise, that so small a portion of the public attention should be directed to the matter of extinguishing fires. It is only when roused by some great calamity that people bestir themselves; and then there is such a variety of plans proposed to avert similar cases of distress, that to attempt to concoct a rational plan out of such a crude, ill-digested, and contradictory mass of opinion, requires more labour and attention than most people are inclined to give it, unless a regular business is made of it.* In Paris, the corps of military firemen are so well trained, that although their apparatus is not so good as it should be, the amount of the losses by fire is comparatively trifling. If the head-quarters of such an establishment were

* The *Manuel du Sapeur-Pompier*, by Colonel A. J. B. De Plazanet, should be studied by every one taking an interest in such establishments.

to be in London, a store of apparatus, constructed on one uniform plan, could be kept there, to be forwarded to any other part of the kingdom where it might be required. This uniformity of the structure and design of the apparatus could extend to the most minute particulars ; a screw or a nut of any one engine would fit every other engine in the kingdom. A dépôt could also be kept at head-quarters, where recruits would be regularly drilled and instructed in the business, and a regular system of communication kept up with all the provincial corps. Any particular circumstances occurring at a fire would thus be immediately reported, and the advantages of any knowledge or experience thus gained, would be disseminated over the whole kingdom. As the matter at present stands, one town may have an excellent fire-engine establishment, and another within a few miles a very indifferent one, and when the one is called to assist the other, they can neither act in concert, nor can the apparatus of the one in case of accident be of the smallest service in replacing that of the other. The best, might, (if a proper communication were kept up,) be under frequent obligations to the worst, and here, as in other matters, it is chiefly by communicating knowledge that it is increased. If the whole experience of the country were brought together, and maturely considered and digested by persons competent to judge, I have no doubt that a system might be introduced suitable to the nation and the age in which we live. Instead of hearing of the

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"dreadful losses by fire," and the "great exertions" made to extinguish it, all the notice would be, such a place took fire, the engines arrived, and it was extinguished.

It would be useless in me to enter into the details of a plan which I have little hope of ever seeing realized. I may state, however, that a premium might be offered for the best engine of a size previously agreed upon, which, when finished, should be kept as a model.

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Specifications could then be made out, and estimates advertised for, for all the different parts, such as wheels, axles, levers, cisterns, barrels, soles, air-vessels, &c. separately. When any particular part of an engine was damaged, it could be immediately replaced, and the engine again rendered fit for service; and upon emergency any number of engines could be set up, merely by putting the different parts together. The work would also be better done; at least it would be much more easy to detect faults in the materials or workmanship than if the engines were bought ready for use. These remarks apply to all the rest of the apparatus.

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It could be provided that firemen might be enlisted for a term of years. When enlisted, they would be sent to the dépôt at head-quarters, drilled to the use of the engines, and carefully instructed in separating and cleaning the different parts. Here also they could be practised in gymnastic exercises, and generally instructed in every thing tending to

promote their usefulness as firemen. They could then be sent off to some large towns, and, after having seen a little active service, distributed over the country in such parties, as might be deemed necessary for the places they were intended to protect.

The practice of keeping fire-engines at noblemen and gentlemen's seats, and large manufactories in the country, is by no means uncommon, and I have no doubt that many more would supply themselves in this way, if they knew where to apply for information in such matters; but the great fault lies in the want of persons of skill and experience to work them when fire occurs. In the way I have mentioned, proprietors and others could have one or more of their workmen instructed in this necessary piece of duty; and I have no doubt that many gentlemen would avail themselves of the means of instructing some of their servants.

It will be observed, I do not propose that the firemen who are enlisted, drilled, and instructed in the business, should be sent to the different stations in sufficient numbers to work the engines; this part of the work can be performed by any man accustomed to hard labour, as well as by the most expert fireman, and the local authorities could easily provide men for this purpose. In small towns, where fires are rare, the novelty would draw together plenty of hands; and in large towns, where the inhabitants are not sufficiently disinterested to work for nothing, there are always plenty of porters, chairmen, &c., who, when they receive their badge,

could be bound to assist in cases of fire at a certain rate per hour, to be paid upon a certificate from the fireman who has charge of the engine at which they worked. The trained firemen would thus be required only for the direction of the engine, attaching the hose, &c.

I am quite aware that many people object to the training of firemen ; but it would be just as reasonable to give to a mob all the "materiel" of war, and next day expect it to act like a regular army, as to expect engines to be managed with any general prospect of success, unless the men are properly trained and prepared for the duty which is expected from them. Fire is both a powerful and an insidious enemy, and those whose business it is to attack it, will best succeed, when they have become skilful and experienced in the use of their arms.

A P P E N D I X.

THE following papers, and annual reports of the Fire-engine Committee, are inserted with a view to show the progress, the annual expense, and other particulars of the Establishment, which has been formed here under the directions of the General Commissioners of Police.

The regulations therein laid down are such as were judged necessary at the time when they were framed, which was before the actual effect of the system could be anticipated. If they were to be revised now, when experience has shown both what is required, and what may be expected, some superfluous regulations might be left out, and several useful modifications might be introduced. The confidence which is now felt by all classes in the efficiency of the establishment, has had the effect of preventing the excitement which used formerly to prevail on every alarm of Fire ; so that now, instead of multitudes congregating on such occasions, the firemen attract comparatively little notice while they proceed in a silent regular manner to do their duty ; and if the intelligence were not communicated by the public press, few cases of fire would be heard of beyond the streets in which they take place.

In examining the Reports containing the annual state-

ments of expenditure, it must be kept in view that the Edinburgh Police bounds, which are protected from fire by this establishment, extend about three miles from north to south, and nearly the same from east to west.

The annual valued rental of the property, after deducting all buildings occupied as public charities, or for government purposes, or for the purposes of education and science, amounts to £462,388, containing a population of 130,000 souls. The property and population of the adjacent town of Leith are not included in the above, although assistance is occasionally given there when required.

No I.

FIRE REGULATIONS.

Council Chamber,
Edinburgh, 27th January, 1825.

THE Lord Provost and Magistrates of the city, and the Sheriff-depute of the county of Edinburgh, do hereby enact the following Regulations, to be observed on occasions of fires within the bounds of police, and order the same to be printed, published, and circulated.

ALEX. HENDERSON, { (Signed) } AD. DUFF, *Sheriff-depute*
Lord Provost. { of the county of Edinburgh.
WILLM. PATISON, B.
ROB. WRIGHT, B.
ROB. MORTON, B.
PET. FORBES, B.

I.—GENERAL REGULATIONS.

1. A list of the engine-houses, and the residences of the master of engines and head engine-men in each district, shall be publicly advertised, that no one may be ignorant where to apply in cases of fire ; and, in the event of fire breaking out in any house, the possessor shall be bound to give instant notice of it at the nearest station ; and shall take particular care to keep all doors and windows shut in the premises where the fire happens to be.

2. "Fire-engine house" shall be painted in large characters on one or more prominent places of each engine-house ; and the residences of the master of engines, head engine-men, inspectors of gas-companies, and water-officers of the district, shall likewise be marked there.

3. The head engine-men and firemen shall reside as near the engine-house as possible.

4. As, in the case of a fire breaking out, it may be necessary to break open the doors of houses and shops in the neighbourhood, in order to prevent the fire from spreading, it is ordered, that no possessors of houses or shops in the neighbourhood shall go away, after the fire has broken out, without leaving the key of their house or shop, as otherwise the door will be

broken open, if necessary ; and it is recommended that all possessors of shops shall have the place of their residence painted upon their shop-doors, that notice may be sent them when necessary.

II.—POLICE.

1. Upon any watchmen discovering fire, he shall call the neighbouring watchmen to his assistance,—shall take the best means in his power to put all concerned upon their guard,—and shall immediately send off notice to the nearest office and engine-house. The watchman who is despatched to give these intimations shall run as far as he can, and shall then send forward any other watchman whom he may meet, he himself following at a walk to communicate his information, in case of any mistake on the part of the second messenger.

2. Upon intimation of a fire being received at the main office, or a district-office, the head officer on duty shall instantly give notice thereof to the head engine-man of the district, to the master of engines, to the water-officers of the district, and to the inspectors of the different gas-light companies, and shall have power, if his force at the office at the time be deficient, to employ the nearest watchmen for these purposes ; and, on intimation being first received at a district-office, the officer on duty in the office shall immediately send notice to the main office.

3. Upon intimation being received at the main office, the officer on duty shall also instantly send notice to the superintendent of police, and the lieutenants not at the office at the time,—to the master of engines,—to the head engine-men of the various districts,—to the superintendent of the water-company,—to the Lord Provost or chief magistrate for the time,—to the Sheriff of the county,—to the bailie residing nearest the place,—to the dean of guild,—to the members of fire-engine committee of commissioners of police,—to the moderator of the high constables,—and also to the managers of the different gas-light companies.

4. The officer on duty at the main office shall, with the least possible delay, send off to the fire a party of his men, under the command of a lieutenant or other officer.

5. This party, on arriving at the spot, shall clear off the crowd, and keep open space and passages for the firemen and others employed.

6. The officer commanding this party of the police shall attend to no instructions except such as he shall receive from the acting chief magistrate attending ; or, in absence of a magistrate, from any member of the committee on fire-engines ; and the men shall attend to the instructions of their own officer alone.

7. Three or more policemen shall be in attendance upon the acting chief magistrate and fire-engine committee; two policemen shall constantly attend the master of the engines, to be at his disposal entirely; and one policeman shall attend with the water-officer at each fire-cock that may be opened.

8. The superintendent of police shall always have a list of extra policemen hung up in the police-office, who, upon occasions of fire, may be called out, if necessary, and twenty of these extra men shall always be called out upon notice of fire being received at the main office, for the purpose of attending at the police-office, and rendering assistance where it may be required. The superintendent shall likewise have a supply of fire-buckets, flambeaux, and lanterns, at the office, to be ready when wanted.

9. There shall be no ringing of alarm-bells, beating of drums, or springing of rattles, except by written order from the chief magistrate for the time; but the alarm may be given by despatching messengers, with proper badges, through different parts of the town, when considered necessary.

III.—MASTER OF ENGINES.

1. On receiving notice of a fire, the master shall instantly equip himself in his uniform, and repair to the spot where the fire is.

2. The necessary operations to be adopted shall be under the absolute control of the master, who shall issue his instructions to the head engine-men and firemen.

3. The master shall report from time to time to the chief magistrate in attendance (through such medium as may be at his command, but without his leaving the spot), the state of the fire, and whether a greater number of policemen, or a party of the military, be required, and any thing else which may occur to him; and the master shall observe the directions of the chief magistrate attending, and those of no other person whatever.

4. The master shall frequently inspect the engines, and all the apparatus connected therewith; he shall be responsible for the whole being at all times in good order and condition; and he shall have a general muster and inspection at least once every three months, when the engines and all the apparatus shall be tried. He shall also instruct the engine-men, firemen, and the watchmen, to unlock the plates, and screw on the distributors of the fire-cocks, or open the fire-plugs.

5. Whenever any repairs or new apparatus shall appear to be necessary, the master shall give notice to the clerk of the police, whose duty it shall be instantly to convene the committee on fire-engines.

6. Upon a fire breaking out, the master shall lose as little

time as possible in stationing chimney-sweepers on the roofs of the adjoining houses, to keep them clear of flying embers ; and also persons in each flat of the adjoining houses, to observe their state, and report if any appearances of danger should arise ; such persons taking as much care as possible *to keep all doors and windows of said flats shut,** and the doors and windows of the premises where the fire happens to be shall, so far as practicable, be carefully kept shut.

7. The master shall forthwith prepare regulations for the firemen, &c. under his charge, and report the same to the committee on fire-engines for their approval. Every fireman shall be furnished with a copy of such regulations, and shall be bound to make himself master of its contents ; and it shall be the duty of the master of engines to see that the instructions are duly attended to in training and exercising the men.

IV.—HEAD ENGINE-MEN.

1. Each head engine-man shall attend to the engines placed in his district, and all the apparatus connected therewith, and report to the master when any repairs or new apparatus seem requisite, and shall be responsible for the engines being in proper working condition at all times.

2. Upon receiving notice of a fire, the head engine-men shall call out the firemen in their respective districts ; and they shall all repair, perfectly equipped, with the utmost expedition, to the spot where the fire happens to be, carrying along with them the engines and apparatus.

3. The head engine-men shall have the carts and barrels attached to their several districts always in readiness, in good order, and the barrels filled with water, which shall accompany the engines to the fire,

4. On arriving at the spot, the head engine-men shall take their instructions from the master, or, in his absence, from the chief magistrate in attendance on the spot ; or, in their absence, from a member of the fire-engine committee, and from no other person whatever.

V.—FIREMEN.

1. The firemen shall attend at all times when required by the head engine-men or master, as well as upon the days of general inspection. They shall keep their engines in good

* Nothing adds more energy to a fire, than giving access to the air by opening doors, &c. A fire will sometimes smother itself, and go out, if the air be excluded,

order and condition, and shall be equipped in their uniform, at all times when called out.

2. They shall observe the instructions of no person whatever, except those of the master or head engine-men.

V.—HIGH CONSTABLES AND COMMISSIONERS OF POLICE.

1. Upon occasions of fire, the moderator of the high constables shall call out the high constables, and, if necessary, he shall also call out the extra constables, and give notice to the moderators of Canongate, Calton, and Portsburgh, to call out the constables of their districts; and it shall be the duty of the constables to preserve order and to protect property, to keep the crowd away from the engines and those employed about them; and, when authorised by the chief magistrate, master of engines, or, in the absence of a magistrate, by a member of the committee on fire-engines, to provide men for working the engines.

2. Neither the constables nor the commissioners of police shall assume any management, or give any directions whatsoever, except in absence of a magistrate and the master of engines; in which case any member of the committee on fire-engines may give orders to the head engine-men.

3. In cases of protracted fire, when extra men may be required to relieve the regular establishment, it shall be the duty of the high constables to collect those wanted from amongst the persons on the street who may be willing to lend their assistance, mustering them in such parties as may be required, taking a note of their names, and furnishing each individual with a certificate or ticket, with which the moderator of the high constables, or chief constable at the time, will be supplied; and no person shall receive any remuneration for alleged assistance given at a fire, who may not produce such certificate or ticket.

4. The party or parties so mustered shall be placed and continue under the care of two high constables, until required for service, when they shall be moved forward to the engine.

3. The men relieved by the party so moved forward shall be taken charge of by two high constables, who shall see them properly refreshed and brought back within a reasonable time, so that the men employed may thus occasionally relieve each other without confusion, and without being too much exhausted.

VII.—MAGISTRATES, &c.

1. Upon occasion of fires, the magistrates, sheriff, moderator of the high constables, the superintendent of the water-company, the managers of the different gas-light companies,

and the fire-engine committee, will give their attendance. They will assemble in such house nearest to the place of the fire as can be procured; of which notice shall be immediately given to the officer commanding the police on the spot.

2. The orders of the chief magistrate in attendance shall be immediately obeyed; and no order except those issued by such magistrate, and the particular directions given as to the fire and engine department by the master of engines, or, in their absence, by a member of the fire-engine committee on the spot, shall be at all attended to.

3. The magistrates and sheriff further declare, that all porters holding badges, and chairmen, shall be bound to give their attendance at fires when called upon for that purpose.

VIII.—GAS-LIGHT COMPANIES.

The managers of the different gas-light companies, on receiving notice of a fire, shall instantly take measures for turning off the gas from all shops and houses in the neighbourhood of the fire.

No II.

Regulations for the Firemen belonging to the Edinburgh Fire Establishment, by Order of the Fire-engine Committee of the Commissioners of Police.

Captains.—On the alarm of fire being given, an engine must be immediately despatched from the main-office to whatever district the fire may be in; and the captain in whose district the fire happens shall bring his engine to the spot as quickly as possible, taking care that none of the apparatus is awanting. On arriving at the spot, he must take every means in his power to supply his engine with water, but especially by a service-pipe from a fire-cock, if that be found practicable. Great care must be taken to place the engine so that it may be in the direction of the water, with sufficient room on all sides to work it, but as little in the way of persons employed in carrying out furniture, &c., as possible. He must also examine the fire while the men are fixing the hose, &c., that the water may be directed with the best effect.

The captains shall be responsible for any misconduct of their men, when they fail to report such misconduct to the master of engines.

The engines must be at all times in good working order, and the captain shall report to the master when any part of the apparatus is in need of repair.

When the fire is in another district, the captain of each engine shall get his men and engine ready to proceed at a moment's notice, but must not move from his engine-house till a special order arrives from a lieutenant of police or the master of engines.

Sergeants.—The sergeant of each engine will take the command in absence of the captain. When the captain is present, the sergeant will give him all possible assistance in conducting the engine to the fire; and it will there be more particularly the sergeant's duty to see that the engine is supplied with water, and that every man is at his proper station, and to remain with his engine while on duty, whether it is working or not, unless he receives special orders to the contrary.

Pioneers.—Nos. 1, 2, 3, and 4 of each engine will be considered pioneers. Nos. 1 and 2 will proceed to the fire immediately, without going to their engine-house, in order to prepare for the arrival of the first engine, by ascertaining and clearing a proper station for it, and by making ready the most available supplies of water, as also to examine the state of the premises on fire and the neighbouring ones, so as to be able to give such information to the captain on his arrival as may enable him to apply his force with the greatest effect. *The pioneers will attend particularly to the excluding of air from the parts on fire by every means in their power, and they will ascertain whether there are any communications with the adjoining house by the roof, gable, or otherwise.* When the several engines arrive, the pioneers will fall in with their own company, and take their farther orders from the captain or sergeant.

Firemen.—On the alarm of fire being given, the whole company belonging to each engine, (Nos. 1 and 2 excepted) shall assemble as speedily as possible at their engine-house, and act with spirit under the orders of their officers in getting every thing ready for service. Each man will get a ticket with his own No. and the colour of his engine marked upon it; and on all occasions when he comes on duty, he will give this ticket into the hands of a police-officer, who will be appointed by the officer of police on duty to collect them at each engine-house, and who will accompany the engine if it is ordered to the fire.

If the ticket be not given in, as before provided, within half an hour after the alarm is given at their engine-house, or, at all events, within half an hour after the arrival of the engine at the fire, the defaulter will forfeit the allowance for turning out, and also the first hour's pay.

If not given in within the first hour, he will forfeit all claim to pay.

The master, however, may do away the forfeiture in any of these cases, on cause being shown to his satisfaction.

On quarter-days and days of exercise, every man must be

ready equipped at the appointed hour, otherwise he will forfeit that day's pay, or such part of it as the master may determine.

Any man destroying his equipments, or wearing them when off duty, will be punished by fine or dismissal from the service, as the master may determine.

Careless conduct, irregular attendance at exercise, or disobedience of superior officers, to be punished as above-mentioned.

The man who arrives first at the engine-house to which he belongs, *properly equipped*, will receive three shillings over and above the pay for turning out.

The first of the Nos. 1 and 2 who arrives at the fire, *properly equipped*, in whatever district it may be, will receive three shillings over and above the pay for turning out.

No pay allowed for a false alarm, unless the same is given by a watchman.

As nothing is so hurtful to the efficiency of an establishment for extinguishing fires as unnecessary noise, irregularity, or insubordination, it is enjoined on all to observe quietness and regularity, to execute readily whatever orders they may receive from their officers, and to do nothing without orders.

The first engine and company which arrive at the fire are not to be interfered with, nor their supplies of water diverted from them by those coming afterwards, unless by a distinct order from the master of engines, or, in his absence, from the chief magistrate on the spot. The same rule will apply to each succeeding engine which takes up a station.

The men must be careful not to allow their attention to be distracted from their duty, by listening to directions from any persons *except their own officers*; and they will refer every one who applies to them for aid to the master of engines, or to the chief magistrate present at the time.

All the firemen must be particularly careful to let the watchmen on their respective stations know where they live, and take notice when the watchman is changed, that they may give the new one the requisite information.

The men are particularly cautioned not to take spirituous liquors from any individual without the special permission of the captain of their engine, who will see that every proper and necessary refreshment be afforded to them; and, as intoxication upon such alarming occasions is not merely disreputable to the corps, but in the highest degree dangerous, by rendering the men unfit for their duty, every appearance of it will be most rigidly marked; and any man who may be discovered in that state shall not only forfeit his whole allowances for the turn-out and duty performed, but will be forthwith dismissed from the corps.

All concerned are strictly enjoined to preserve their presence of mind, not to lose temper, and upon no occasion what-

soever to give offence to the inhabitants by making use of uncivil language or behaving rudely.

Police Office, Edinburgh, January 17, 1826.

* * Every one belonging to the establishment will be furnished with a printed copy of these Regulations, which they are enjoined carefully to preserve and read over at least once every week.

No III.

*General View of the Receipt and Expenditure of the Edinburgh Police Fire-engine Establishment.**

THE very defective state of the means of extinguishing fires in Edinburgh had for some time attracted notice; but the public attention was more particularly called to it, in consequence of the fire which occurred in Niddry Street in February, 1824,—a subsequent fire in the New Buildings, North Bridge Street, in March following,—and the fire opposite the Royal Exchange in June that year; on all which occasions the want of efficient assistance was most conspicuous. This induced the Commissioners of Police to take up the business, who, in the month of August, 1824, appointed a Committee of their number to inquire and report.

The Committee held various meetings with several of the Magistrates and the Managers of the Fire Insurance Companies, with the view of organizing an efficient system; and a subscription was made by these bodies for the purpose of defraying so far the annual expense, it being agreed that the defi-

* Immediately after the great and calamitous fires which occurred here in 1824, a subscription, amounting to L.11,702, 4s. 4d., was raised for behoof of the sufferers. When the committee appointed for the distribution of this fund, had paid such applicants as appeared to them to have claims, either for losses suffered, or services performed, a balance of L.4977, 11s. 1d. remained in their hands. Many plans were proposed for the disposal of this balance, and it occurred to the Commissioners of Police, that as the original purpose of the subscription had been accomplished, the balance might, with great propriety, be converted into a fund for the relief of such firemen as might be hurt in the execution of their duty, and in the event of their death, as a means of provision for their families.

For this purpose an application was made to the General Meeting of Subscribers to the Fund, which was held for the purpose of disposing of the balance, and the Appendix marked No 3 was printed, and circulated as widely as possible, in order to show to the public the necessity of some such permanent fund.

The Commissioners of Police were successful in their application, and the money is now appropriated to this purpose.

ciency should be paid out of the police funds. But before it was possible to procure and train a body of firemen, or to form other arrangements, the alarming fire in November, 1824, took place. On that occasion almost all the engines that were of the smallest use were completely worked out.

This induced new meetings with the Magistrates and the Managers of the Fire Insurance Companies; and the Police Committee feel much satisfaction in testifying, that the utmost liberality was displayed on that trying occasion.

The Magistrates agreed to pay L.200 out of the funds of the community, for the purpose of assisting in procuring a new set of engines, with a full complement of all other necessary apparatus; and the following Scotch Fire Insurance Companies contributed each the like sum of L.200, viz.—

The Friendly,
Caledonian,
Hercules,
North British,
Insurance Company of Scotland,
And Scottish Union;

making in all L.1400, for the above purpose, while the Commissioners agreed to make up the deficit.

In consequence of this arrangement, the Police Committee continued their exertions; and, in the first place, procured and trained, by regular exercise, a body of 80 firemen, under the command of a superintendent and other officers. They have also either already provided the establishment with the following articles, or have ordered them, as necessary for rendering it complete, viz.

Three large new engines, (London-made,)	L.530	17	4
Freight of ditto,	16	3	5
Sundries for ditto in Edinburgh,	19	0	0
4 Smaller engines,	210	0	0
6 Portable ditto,	22	10	0
2 Large water-carts, with butts,	42	0	0
8 Smaller ditto,	96	0	0
Carriage for spare pipe,	12	0	0
Clothing and helmets for 80 firemen,	181	19	1
Additional fire-buckets,	39	17	5
Hatchets, &c.	18	8	10
Triangles,	35	0	0
Suction-tubs and carriages,	33	0	0
Suction-pipe,	9	0	0
500 feet additional pipe, amounting to about	95	0	0
A variety of small furnishings, consisting of ropes, ladders, and such like, furnished and to be furnished, about	100	0	0
Carry forward,	L.1460	16	1

	Brought forward,	L.1400	16	1
Repairs and alterations on engine-house, High Street, about	L.50	0	0	
Price of engine-house, Portsburgh,	420	0	0	470 0 0
				L.1930 16 1

Note.—The Commissioners rent an engine-house for the New Town district; but have been for some time at much loss for one for the southern districts. They are at present ill accommodated, and must expend a considerable sum for a new one as soon as they can find a proper place.

45	But the grand article of expense consists of what is necessary for a proper number of fire-cocks. There were only 45 in the whole town when this committee was established, and since that time 52 new ones have been erected, at an expense (after making allowance of L.2, 2s. for each, which the Water-Company engaged to pay) of	365	11	0
80	And it is proposed to erect other 80, which are calculated (after deducting the Water-Company's allowance), to cost	661	17	0
177				In all, L.2958 4 1

Thus, upon the necessary stock of articles for the establishment, and the erecting of additional fire-cocks, the Commissioners of Police must expend a very large sum, in addition to the contributions by the city and the Scotch companies.

Upon the article, again, of annual support of the establishment, the cost is very great. The annual contributions by the city of Edinburgh and the fire insurance offices, including several English agencies, amount to about L.335; but the pay of 80 firemen and their officers—the expense of turning out in cases of alarm, and on days of exercise—the constant repairs of the engines—and the tear and wear of all the apparatus, will be, from experience hitherto, more than double that money. There is thus a very heavy charge on the police funds on both branches of the establishment, while nothing is levied from the inhabitants on account of it.

But, besides all this, there is a very important fund altogether wanting, namely, for relief to such firemen or others as may receive bodily injury in the service, and for providing for the families of such as may be killed. It is well known that such accidents often happen, and, on all occasions, there

is great danger in the business of a fireman ; so that, if they are not to be relieved when injured, and their families provided for in the event of their death, it is manifest that they will not encounter the risks which they otherwise would do. Unless a direct tax were to be laid on the inhabitants, in order to provide for such casualties, the committee know of no source from which it can be procured, except the surplus of the late subscriptions, because it would be unreasonable to expect any thing more from the town of Edinburgh, or the fire-insurance companies. It therefore becomes a matter of deep and serious consideration for the subscribers, and for the inhabitants at large, whether the present opportunity of providing such fund should be suffered to escape.

(Signed) DAV. MURRAY, *Convener.*

POLICE OFFICE, EDINBURGH,
22d December, 1826.

NO IV.

Report of the Fire-engine Committee to the General Board of Commissioners of Police.

Edinburgh, 29th November, 1826.

✓ FROM the previous Reports of the Committee, the Board are so far acquainted with the circumstances which render it desirable that an establishment for the protection of the public against fire should be set on foot, under the control and superintendence of some part of the constituted authorities, that it seems unnecessary to enter upon these in any great detail. Suffice it to say, that the fires which occurred in Niddry Street, in the New Buildings on the North Bridge, and in the High Street, opposite to the Royal Exchange, first drew the attention of the Commissioners of Police to the subject, in consequence of the very conspicuous want of efficient assistance on these occasions, and the manifest defect in the application of the very inefficient force which could then be procured ; arising from the defective co-operation on the part of those who had fire-engines, and the want of regularly-trained firemen, which render it indispensable to accept of the aid of any one willing to afford it, whose assistance, consequently, could neither be depended upon, nor enforced, longer, or in any other shape, than the party might be disposed to give it.

These circumstances led the Commissioners of Police to take up the subject ; and they appointed a committee of their number, who held various meetings with the Magistrates for the time, and the Managers of the Insurance Companies against Fire, for the purpose of endeavouring to organize an efficient system. The result of their deliberations was an unanimous

opinion that a fixed plan should be established in future, under the superintending charge of the Police Commissioners, if the Board should be found willing to undertake it. But various details required to be gone into before this proposed arrangement could be completed, particularly as several of the Commissioners expressed doubts of the propriety of the Board taking so very important a matter under their charge, when the statute under which they act neither enjoined it upon them, nor made any special provision for defraying the expense that might thereby be incurred. Several of the Commissioners were, however, of opinion, that although the protection of the public against fire was not specially provided for by the Police Act, yet that it naturally fell under the ordinary powers of watching; and the Board ultimately came to the resolution*, that unless adequate apparatus were provided, and proper regulations established, it would be inexpedient for them to undertake the superintendence of the establishment.

Pending these discussions, the very destructive fires of November 1824,—when the total want of efficient fire-engines, and of unity of management or co-operation on the part of those to whom the existing ones belonged, became still more conspicuous, and the alarming extent to which these fires went, notwithstanding the unwearied exertions of all classes of the inhabitants,—forcibly recalled the attention of the Police Commissioners to the subject; more particularly, as the whole of the engines were then rendered nearly unserviceable, and the town was, in some degree, left destitute of that indispensable means of protection, in the event of the recurrence of a similar calamity.

The Committee, therefore, again held various meetings with the Magistrates and Managers of Insurance Companies, with the view of ascertaining, as accurately as possible, the probable expense of organizing a Fire-engine Establishment upon the principles laid down in the minute before referred to. That Committee had not, at that time, any correct data to enable them to ascertain, with accuracy, either the expense which would be requisite for the original formation and outfit of such an establishment, or the annual expense which it would necessarily entail. But after consulting on these points with the Magistrates and the Managers of the Insurance Companies, some of whom had previously kept fire-engines, it appeared to the then Committee, that a sum of L.1400 sterling would be adequate to the formation of the establishment, and that an annual expenditure of L.500 would be sufficient to keep it up. The first of these sums, being the calculated expense of outfit, was very handsomely agreed to be defrayed

* Minute of 22d November, 1824.

by the Magistrates, and by the six following Insurance Companies, viz., the Edinburgh Friendly, the Caledonian, the North British, the Hercules, the Scottish Union Insurance Companies, and the Insurance Company of Scotland, each of whom agreed to contribute a sum of L.200 sterling,—thus making up the L.1400 requisite for the outfit of the establishment;* whilst the town agreed to give an annual subscription of L.50, and the above companies, with various others, whose names are appended to this report, agreed to pay an annual subscription of L.20, L.10, and L.5 respectively, making up, in whole, an annual subscription of L.335 sterling, equal to two-thirds of the calculated annual expense.

These calculations of expenditure, and arrangements with the Magistrates and Insurance Companies, having been reported to the Board, and that, by consequence, an annual expenditure of from L.150 to L.200 sterling only would be requisite on their part, the Commissioners came to the resolution, that, in the meantime, they would consent to take the charge of the establishment upon themselves, though under the reservation of full power to abandon it, should the subscriptions of the Insurance Companies be withdrawn or diminished, or the extra expense be found to exceed what the Board might consider proper to be defrayed by the public.

They therefore vested full powers in the Committee to proceed with the formation of the establishment; and it remains to state the measures which have been adopted under these powers, and the results that have been produced.

I.—IN RESPECT OF THE EQUIPMENT OF THE ESTABLISHMENT,

The Committee have purchased for the establishment three new engines of a large size, requiring twenty men each for their proper working. They have also procured five portable engines, which have been found of most essential service in the early extinguishing of fires, before reaching a height which would have rendered the use of large engines indispensable; and they have farther purchased six small hand-engines, which may be easily transported and carried into any room or closet on fire, and have been found highly beneficial for the speedy extinguishment of fires, which, had they not been kept down by their early use and timeous application, might have proved destructive to the building in which the fire originated. They have furnished these engines with a complete set of hose, screws, and apparatus; such as coupling-joints, water-buckets,

* It is proper likewise to mention, that the Sun Fire Office, at same time, agreed to hand over their fire-engine and apparatus to the establishment, which they considered to be nearly equivalent to a similar subscription, though it has not proved so; the engine having been found to be almost completely worked out and inefficient.

suction-tubs, hatchets, saws, ladders, &c. ; and they have established water-carts for the service of the engines, which are kept uniformly filled with water, and ready for immediate use, in case of an emergency.

The expense of this portion of the outfit, the details of which are fully given in the General Statement of the Income and Expenditure of the Establishment, made up by the Accountant for the Board, and which is now laid upon their table for the inspection of all concerned, amounts to L.1475 5 10

But in addition to this expense, the Committee, under the sanction of the Board, have established a regular corps of firemen, who have been provided with the requisite clothing and appointments, at an expense of

191 5 1

They have partly purchased, fitted up, and repaired engine-houses, at a cost of

325 3 8

And they have incurred various miscellaneous disbursements for models, reports by tradesmen of skill, ticket-boards for firemen, printing regulations for their conduct on duty, advertisements, freight of engines from London, &c. amounting to

179 0 9½

The particulars of the whole of these payments will be seen in the General Statement prepared by the Accountant before referred to ; and the expenditure on the mere articles absolutely necessary for the original outfit of the establishment thus amounts to a sum of

L.2170 15 4½

Exceeding the subscriptions obtained for these purposes by L.770 : 15 : 4½.

Nor is this the whole expense, even as applicable to the article of original outfit, now under consideration ; for, in addition to the above, the Board have been subjected to a very heavy expenditure for the article of fire-cocks, not originally contemplated by them. By the terms of the Water Company's Act, they were bound to establish *fire-plugs* at convenient places, for the supply of water ; but after consulting with their Engineer, and other persons of skill, it was found that plugs were quite inadequate to the proper purposes ; on which account, *fire-cocks* were very strongly recommended, as being greatly preferable in every respect, and affording, in many situations, the means of subduing fires even without the aid of the engines. The Committee had various meetings with the Committee appointed by the Water Company, with the view of getting them to substitute fire-cocks in lieu of the plugs

they were bound to furnish in terms of their act; but their endeavours to obtain this alteration from the Water Company were unsuccessful, as all that Company would agree to do was, to pay a sum of L.2, 2s. for each *fire-cock* which might be set up by the Police, in lieu of the fire-plugs which might have been demanded from them.

The Committee, under the deep impression of the necessity of providing properly against the recurrence of such extensive fires as the town had been alarmed by in the year 1824, found themselves reluctantly obliged to acquiesce in the terms proposed by the Water Company; and they have accordingly repaired such old fire-cocks as previously existed, and established ninety-six new ones in various parts of the city, at an expense of L.1265 : 5 : 1, from which, however, they have to deduct the allowance obtained from the Water Company of two guineas each, amounting to L.201, 12s., leaving an expenditure on this article alone of L.1063 : 13 : 1. Eight of the old fire-cocks required to be replaced by new ones, which has been done at the expense of the Police; and a demand has been made upon the Water Company for the L.2, 2s. applicable to each of them, which at present they have declined to pay, though it is expected the demand will be ultimately complied with.

II.—IN RESPECT OF THE ANNUAL EXPENSE OF THE ESTABLISHMENT.

The permanent expense on this establishment, for the two years it has now been in operation, has been as follows, viz.

1. Salaries to Master of Engines and to his Assistant,	L.169	14	0
2. Pay to firemen:			
1. Permanent pay,	L.210	15	4
2. Pay for exercise days,	82	11	6
3. Pay on occasion of fires,	778	11	10
		1071	18 8
3. Refreshments at fires,		35	1 4
4. Repair of the engines, hose, &c.			
1. Of engines, &c.	L.85	16	11
2. Of clothing,	4	9	0
3. Of fire-cocks,	13	11	5
		103	17 4
5. Rent and repair of engine-houses,		22	4 0
6. Miscellaneous disbursements, including advertising, printing, stationary, horse-hires, relaying causeway where broken up, &c. &c.		47	6 6
	L.1450	1	10

Thus, the expenditure of the establishment for the two years it has now been in operation has amounted to L.1450 sterling, being nearly L.500 above the estimate calculated at the time of entering upon the arrangement; and it requires to be mentioned, that during the first year the salary to the master of engines was paid only at the rate of L.50, whilst, from the circumstance of his time and attention being found necessary to be almost exclusively devoted to the establishment, it behoved to be increased to L.100 for the second year; and the aid of an assistant, at a wage of 18s. per week, was found indispensable for keeping the articles of the establishment in proper repair and condition for use. The number of firemen, likewise, has only been progressively increased to its present strength: and under all these views, it is considered by the Committee, that the annual expense of the establishment cannot amount to less than L.800 sterling, at which sum it has been calculated in framing the estimates for the current year.

The number of fires which have occurred during the two years the establishment has been in operation has been 128; of these 15 were extensive, 28 were serious at their first appearance, but were speedily reduced after the arrival of the engines, and 85 were of minor importance, easily subdued by the firemen with the use of the smaller engines, though one, at least, of the large ones was generally brought to the spot in case of necessity. Some of these have been what may be styled false alarms, arising from foul chimneys, where individuals have raised the cry of fire, and brought engines to the spot, without any adequate necessity, but in consequence of which expense has been, in every case, unavoidably thrown upon the establishment.

The strength of the establishment, so far as not already fully detailed, consists of a master of engines, an assistant, four headmen, four overseers, sixteen pipemen, and fifty-six firemen. The duties of the master of engines are various; as, besides his duty upon occasions of fire, he inspects the engines and apparatus connected with them, and is responsible for their being at all times in good order and condition when required. He musters the men for exercise at such times as may be considered necessary, either for their instruction, or the trial of the engines and hose; and he has the general superintendence of the fire-cocks, besides many subordinate duties, into the detail of which it is unnecessary to enter. The duties of the assistant are of an operative description. He has to take down and clean the engines after being used, to make and repair the hose, to clean and oil them properly after being used, to look after the fire-cocks, and generally to attend to and repair the whole implements and apparatus of the esta-

blishment, that they may be at all times fit for service. The four headmen have the charge of the engines and apparatus in their respective districts ; and it is their duty to report to the master when any repairs or new apparatus become requisite, they being held responsible for the engines being in a proper working condition at all times. It is their duty to call out the firemen in their respective bounds upon an alarm being given, to see they are properly equipped, and to repair with their engines and apparatus to the fire with the utmost expedition. The duties of the overseers are of a similar description ; and they have a particular charge of the engines on occasions of fire, when it may be requisite for the master and headmen to be absent inspecting the premises in which the fire may be, so as to ascertain to what point the operations for subduing it may be most efficiently directed. The duties of the firemen are, strict discipline, sobriety, expedition in turning out upon alarm, and obedience to the orders which may be issued to them.

A set of regulations has been framed, and sanctioned by the authority of the Lord Provost, Magistrates, and Sheriff, with the view of enforcing these duties ; and the Committee have much satisfaction in stating to the Board, that under a very minute personal inspection, by many of them individually, upon occasions of fire, they have every reason to be pleased with the conduct of the whole individuals belonging to the establishment. In particular, they consider it due to Mr Braidwood, the master of engines, to report, that he has not only shown the most indefatigable zeal, assiduity, and attention, in forwarding the views of the Committee, for procuring the outfit of the establishment, and in placing and keeping it in the best possible order ; but, upon all occasions of fire, his steady coolness, self-possession, good judgment, and intrepidity, have been most marked and deserving of approbation. The appointment of an assistant to the master has been of very recent date, and was suggested in consequence of the heavy expenses which came upon the Committee, in getting trifling repairs executed upon the engines, hose and apparatus ; some portions of which are necessarily injured more or less upon every occasion of a turn-out. From the experience they have had, they have reason to be satisfied with the conduct and attention of James M'Donald, who has been employed by them in that department ; and they are of opinion that his being retained in his situation will, upon the whole, be a saving of expense to the establishment, and will give greater security for the engines and apparatus being kept at all times in proper order.

With the general conduct of the other members of the esta-

blishment, their readiness to turn out, their discipline when on duty, and their attention and obedience to the orders they may receive, the Committee are likewise bound to express their satisfaction. Some instances of disorder amongst the firemen have occurred ; but they have been very few ; and in all these instances the men have been forthwith dismissed ; and the Committee, as well as the master of engines, have taken the utmost pains to impress upon them the indispensable necessity of strict discipline, sobriety, and obedience to orders when on duty, without which their efforts cannot possibly be expected to be directed with that efficiency which is required.

It is due to the men to state, that they have very generally displayed an earnest zeal to learn and to practise the duties incumbent upon them, so as to render themselves expert upon occasions of fire ; and it has been very gratifying to observe the increasing energy, skill, and confidence, which the firemen have exhibited in consequence of their judiciously-managed training. They have lately begun the practice of the gymnastic exercises at leisure hours, and show a great fondness for it. This must tend materially to increase their individual powers and usefulness ; and the Committee have not only reason to be satisfied with the conduct of the men in these respects, but consider themselves justified in reporting to the Board, that their appearance when called out, their readiness to undertake any duty which may be required of them, and the expertness with which they perform it, are most satisfactory and praiseworthy.

In the formation of a new establishment of this description much trouble and correspondence were unavoidable ; and no efforts have been spared by the Committee in endeavouring to obtain from all quarters, both at home and abroad, the best advice and information, to enable them to organize it upon the most approved and efficient principles ; and they think they are justified in saying, that their apparatus, in plan and workmanship, is at least equal to, and may safely vie with that of any other establishment of a similar description, whilst many of the most useful parts of it have been planned and executed by their own townsmen. In the conduct of the requisite correspondence, the Committee have experienced the most unwearied zeal and attention on the part of Mr Lees, the clerk of police, whose services have been indefatigably and cheerfully bestowed at all times, in such manner as to have merited and received their marked approbation.

The Committee regret that their efforts to obtain a recognition of the Fire-engine Establishment, under the explanatory Police Act, lately passed, proved unavailing ; and they would

recommend that this should be attended to at the earliest opportunity which may conveniently occur, as it would greatly tend to strengthen their powers, particularly in those cases where the engines require to be sent beyond the bounds of police: but they must, at same time, state their conviction, that the objects in view, in placing the establishment under their superintendence and control, have been realized to as great an extent as their most sanguine projector could have anticipated; and that the unity of management, order, and regularity, which have been established, have produced the most beneficial results, by affording to the public better protection against fire, and remedying the previous confusion and alarm which seldom failed to occur upon such occasions, and almost always tended to increase the evil. They are therefore of opinion, that the present system, which was set on foot only as one of experiment, ought to be continued, if the proper arrangements for this purpose can be made and sanctioned by any future Police Act.

Upon the question of expense, it is no doubt undeniable, that the Board has been burdened with a much larger expenditure than was originally contemplated, and for which no provision was made, by authority, to assess for this specific purpose; but the benefit derived by the public from the system as now organized, which concentrates the whole force under one controlling and superintending power, is, on the other hand, highly important, while the expense that has been incurred in original outfit is now got over, and not likely to recur to any considerable extent.

The single exception from this part of the present report respects the propriety of forthwith procuring a proper engine-house for the Southern Districts. When the great and daily increasing extent of this portion of the city is considered, it seems obvious that an engine-house in that quarter is indispensable; and the Committee have been long engaged in endeavouring to find a situation suitable to the purpose, though their efforts have not hitherto been successful. They are desirous that the engine-house should, if possible, be combined with, or at least adjoining to the district watch-house, because thereby the engines and apparatus may be considered as at all times under a safe and proper charge, the access to them rendered easy in case of emergency, and the readiest means afforded of giving immediate notice to the head-office of any fire which may occur. Perhaps a similar arrangement for the New Town would be an improvement; but it is not so necessary, seeing the Board have at present a coach-house hired for the purpose, which, though not adjoining to the district watch-house, is situated at no great distance from it.

The annual expenditure has certainly considerably exceeded the calculation upon which the contributions by the Insurance Companies were founded ; and, from the experience of the last two years, it is now quite apparent, that in place of L.500 per annum, as originally contemplated, the establishment cannot be kept up with proper efficiency under at least L.800 a-year. The principle upon which the contributions of the Town and Insurance Companies were originally fixed was, that these bodies should defray two-thirds of the annual expenditure, leaving the remaining third to be paid out of the police funds ; and, considering the advantages derived by these Companies, the Committee are hopeful they may be disposed to increase their subscriptions to the extent requisite to follow out the original arrangement. Should this not be done, it is still open to the Board to abandon the charge, though the Committee are not at present prepared to recommend that they should do so, as, after all, even if the whole annual expense were exclusively defrayed from the police funds, it would not exceed one halfpenny per pound on the rental of the town, which is altogether unimportant, when viewed in reference to the manifest advantages arising from such an establishment being under efficient superintendence and control. At same time, they are decidedly of opinion, that the Insurance Companies ought to contribute a fair proportion of the expense ; and they hope that these Companies may readily meet the wishes of the Board in this respect.

WM. DOUGLAS, *Convener*.

Edinburgh, 4th December, 1826.

At an adjourned Meeting of the General Commissioners of Police, Mr SHERIFF DUFF in the chair,

The Commissioners approved of the foregoing Report, and unanimously voted their thanks to the Fire-engine Committee, for their unwearied and successful exertions in the formation of an establishment so generally approved of ; and in a special manner to Mr Douglas, chairman of that Committee, for his unremitting attention to the duties of that office, and for preparing so distinct a Report of their proceedings, and of the views entertained by the Committee.

The General Meeting remitted to same Committee to get their Report printed and circulated, and thereafter to meet with the Managers, or Directors, of the different Insurance Companies, for the purpose of obtaining from them an increased annual subscription for the support of the establishment.

Extracted by DA. LEES, *Clerk*.

APPENDIX.

1. Subscription for outfit.

City of Edinburgh,	L.200	0	0
Friendly Insurance Company,	200	0	0
Caledonian do.	200	0	0
Hercules do.	200	0	0
North British do.	200	0	0
Scottish Union do.	200	0	0
Insurance Company of Scotland,	200	0	0
	<u>L.1400</u>	<u>0</u>	<u>0</u>

2. Subscriptions for Annual Expense.

City of Edinburgh,	L.50	0	0
Friendly Insurance Company,	20	0	0
Caledonian do.	20	0	0
Hercules do.	20	0	0
North British do.	20	0	0
Scottish Union do.	20	0	0
Insurance Company of Scotland,	20	0	0
Sun Fire Office,	20	0	0
Royal Exchange Assurance Company,	20	0	0
Phoenix Insurance,	20	0	0
Norwich Union Company,	20	0	0
Beacon Insurance Company,	20	0	0
Guardian do.	20	0	0
Alliance do.	10	0	0
West of England do.	5	0	0
Atlas do.	5	0	0
British Commercial do.	5	0	0
Imperial do.	5	0	0
London Union do.	5	0	0
British Fire Office do.	5	0	0
Dundee do.	5	0	0
	<u>L.335</u>	<u>0</u>	<u>0</u>

Note.—The amount of the annual subscriptions has been diminished, by one of the offices having withdrawn their subscription entirely, and two of them having diminished their subscriptions in amount.

The British Commercial Fire Office is the one which has withdrawn its subscription entirely.

The Beacon Fire Office subscribed L.20 for the first year, but diminished it to L.5 for the second year ; and the Dundee Fire Office, which subscribed L.5 for the first year, reduced it to L.3 for the second,—thus causing a defalcation in the original subscriptions to the amount of L.22 annually.

No V.

Report of the Fire-engine Committee for the Year from October 1826 to October 1827, to the General Board of Commissioners of Police.

Edinburgh, 8th January, 1828.

THE annual report in regard to this establishment has been delayed somewhat beyond the usual period, in consequence of the accounts not having been got framed and passed so early as in the preceding year.

With reference to the detailed report of last year, the Committee have much satisfaction in stating to the Board, that they have every reason to be pleased with the attention that has been paid to this important branch of the establishment, and that the same zeal and assiduity has been displayed on the part of Mr Braidwood, the master of engines, which formerly received the approbation of the Board. The benefits then anticipated to arise from the appointment of an assistant to the master have, in the opinion of the Committee, been realized ; and as they have every reason to be satisfied with the conduct of James M'Donald, the present individual employed in that situation, they recommend that he should be continued in it.

The attention of the men, and the expertness displayed by them on occasion of being called out, are deserving of approbation ; and the best evidence of the value of the establishment, as well as of the increasing skill and energy exhibited by all departments belonging to it, is to be found in this circumstance, that although a great many fires have occurred in the course of the year, none of them have gone to any alarming extent, and by far the greatest part have been very early subdued.

The annual expenditure has not only not decreased, notwithstanding of the reduction which was made, with the approbation of the Board, in the number of men permanently employed, but has been more considerable during this last year than

formerly, its gross amount being L.987:0:1 sterling, as per abstract annexed.

And the Committee see little reason to anticipate a reduction in future. On the contrary, as they very generally think, that, in order to place the establishment on the footing it ought to be, the numbers of the men should be increased to at least the same extent as previous to the reduction referred to, they humbly consider, and beg to report it as their opinion, that the annual expenditure may be expected rather to increase than otherwise.

The number of fires which have occurred during the year amount to 113. Of these 12 were serious fires; 56 may be considered to have had a serious appearance at first sight, and might have proved alarming, except for the confidence which is now so generally felt in the exertions of the establishment. The remainder, 45 in number, were of minor importance, and easily subdued, several of them being little more than false alarms, arising from chimneys taking fire, and other trivial circumstances; but in respect of which a considerable expense was unavoidably incurred, in sending out at least one of the engines, and by the turn-out of the men, which does not easily admit of a check, as a very few minutes' delay, even in the case of a trifling fire, may be eventually attended with the most serious consequences.

In the Annual Report by the Finance Committee, L.1500 is stated to have been paid to the Fire-engine Committee, out of the general police funds, for the last year; but of this sum L.400 was accounted for in the previous year's expenditure, reported upon in November, 1826; so that there has, in fact, been only L.1100 received out of the police funds for the support of the establishment during the bygone year. The discrepancy arises from this circumstance, that the accounts of the Finance Committee are made up from Whitsunday to Whitsunday, whereas those of the Fire-engine Establishment are made up from October to October; and the L.400 of difference referred to was a payment made by the Board in September, 1826. Of the L.1100 appearing in the annual accounts relative to this branch of the establishment, L.520:17:4 has been applied to the annual expenditure, and L.579:2:8 to the liquidation of the debt due at the period of the last report, which has been reduced from L.1036:15:2½, the amount due at October, 1826, to L.457:12:6½, being the total amount of debts and engagements remaining unpaid as at 2d October, 1827, upon applying the balance remaining in bank to the liquidation of these debts.

Upon the subject of the annual subscriptions by the insurance offices, the Committee have to report, that the British

Commercial Fire-office entirely withdrew their annual subscription of L.5 for the last year, while the Beacon Fire-office reduced their subscription from L.20 to L.5, and the Dundee Fire-office reduced theirs from L.5 to L.3,—thus causing a defalcation of L.22 sterling in that branch of the funds, originally looked forward to for the support of the establishment.

The Committee regret to state farther, that the suggestion made in their report of last year, of an increased contribution on the part of the insurance offices, has not been met with that readiness or cordiality which they had hoped to experience.

The town of Edinburgh, however, came forward and increased their subscription from L.50 to L.80 a-year, while the following six Scottish Insurance Offices respectively advanced an additional subscription of L.12 to the L.20 they had previously contributed, viz., the Caledonian, Hercules, Friendly, Scottish Union, North British, and the Insurance Company of Scotland.

These additions, however, are merely temporary, kept entirely dependent upon the pleasure of the parties, and open to be withdrawn when they may think fit; and the principle of an additional subscription, proportionally equivalent to the increased expenditure over its calculated amount when the establishment was originally taken under the charge of the police, seems to be one which the subscribers are by means disposed to recognise.

The English Companies have all declined making any advance upon their original subscription, and have taken no notice of the applications made to them on that subject; and even the additional subscriptions obtained from the Scottish Companies were paid upon the idea, that an act of Parliament would be applied for to place the establishment on a proper footing, and to make the payments by the different Companies doing business in Edinburgh fall with due equality upon each of them.

With this view, notices have been given, under the instructions of the Board, of the intention to bring a bill into Parliament, and the draft of a bill has been framed by the Committee, and submitted to the consideration of the Insurance Companies. If the principles upon which that draft has been framed shall be adopted by the Insurance Companies, it appears to the Committee that it should forthwith be carried into effect, as being by far the best mode that can be adopted for placing the establishment upon a footing of equal justice to all parties concerned; but, on the other hand, should the bill be threatened with serious opposition on the part of these Companies, it may not be prudent to persevere in it; and it will

then rest with the Board to determine, whether they will continue the charge of the establishment under the existing arrangement, or discontinue it, which, in the opinion of the Committee, they are fully entitled to do, if they shall consider it advisable to adopt that measure.

The Committee forbear giving any opinion on this question at present, as they are not willing to anticipate an opposition on the part of the Insurance Companies, though, should it be made, they will then take the subject under their serious consideration, and report their sentiments to the Board as to the proceeding which ought to be followed.

WM. DOUGLAS, *Convener.*

Edinburgh, 14th January, 1828.

At a statutory Meeting of the General Commissioners of Police, Mr SHERIFF DUFF in the chair,

The Commissioners approved of the foregoing Report, and ordered the same to be printed and circulated as formerly.

Extracted by DA. LEES, *Clerk.*

Abstract of the Annual Account referred to in the preceding Report.

INCOME.

1. Contributions from Insurance Offices, viz.			
Annual,	.	.	L.263 0 0
Additional,	.	.	72 0 0
Sum,			L.335 0 0
2. Contributions from city of Edinburgh,	.	.	80 0 0
3. Ditto from Police funds,	.	.	1100 0 0
4. Miscellaneous receipts,	.	.	51 2 9
Total income,			L.1566 2 9

EXPENDITURE.

1. Salaries,	.	.	L.146 16 0
2. Pay to firemen, &c.	.	.	
Permanent pay,	L.108 14 7		
For exercise,	41 6 6		
For fires, &c.	498 6 0		
Sum of these,	648 7 1		

3. Refreshments,		L.4	5	6
4. Tear and wear, viz. of				
Engines, &c.	L.107	13	0½	
Clothing,	7	12	9	
Fire-cocks,	32	4	11	
Sum of these,				147 10 9
5. Engine-houses,	.	14	5	9
6. Miscellaneous disbursements,		25	15	0
Total expenditure,	.			L.987 0 1
Surplus income this year, applied towards the liquidation of former deficit,	.	.	.	L.579 2 8

No VI.

Report of the Fire-engine Committee, and Abstract and Expenditure for the Year from October 1827 to October 1828, to the General Board of Commissioners of Police.

Edinburgh, 28th November, 1828.

IN laying before the Board the annual state of the accounts connected with the Fire-engine Establishment, the Committee are happy to have it in their power to say, that, although the number of fires has been nearly as great as last year, and the proportion of property saved from destruction has not been less, yet the expenditure of the establishment has decreased materially, in consequence principally of the expense of outfit being nearly at an end. The annual amount, however, which will continue to be required from the funds of the Board is, no doubt, considerable; but when the advantages which the community derive from the increased security to their persons and property, and the freedom from frequent alarm, are considered to be the consequences of the efficient state to which this department has been brought, since it has been put under the management of the Commissioners of Police, it is presumed, that few persons will be disposed to think the funds have been ill applied.

As the community at large, as well as the Commissioners of Police, have now had sufficient experience to enable them to

judge of the effect which the present organization of the fire department has produced, the Committee feel, that it would be superfluous to go into any detail on its present state ; they, therefore, only add, that they continue to have every reason to be satisfied with the zeal and good judgment evinced by Mr Braidwood in his management of the apparatus, and in the training of the men, the result of which has been, that, were it not for the occasional notices of fires in the public prints, the inhabitants of this city would hardly ever know of their occurrence, so promptly and effectually have they generally been extinguished.

The Board will observe, under the head of " Precautionary Turns-out," an expenditure of L.11 : 4 : 6, incurred in pulling down a house in the Cowgate, at the request of the Lord Dean of Guild. As this was not connected with the duties of the fire department, and was not ordered by the Committee, it is presumed that this sum will be repaid by the proprietors, through the interference of the Dean of Guild, who has been applied to on the subject.

In the last annual report by the Finance Committee, L.1000 is stated to have been paid to the Fire-engine Committee out of the general police funds for the last year ; but of this sum L.50 was accounted for in the previous year's expenditure ; so that there has, in fact, been only L.950 received out of the police funds for the support of the establishment during the bygone year. The discrepancy arises from this circumstance, that the accounts of the Finance Committee are made up from Whitsunday to Whitsunday ; whereas those of the Fire-engine Establishment are made up from October to October ; and to save the like discrepancy again occurring, the Commissioners have ordered that this report be made up at Whitsunday in time coming. Of the L.950 appearing in the annual accounts relative to this branch of the establishment, L.543 : 4 : 4 has been applied to the annual expenditure, and L.406 : 15 : 8 to the liquidation of the debt due at October, 1827, which has been reduced from L.457 : 12 : 6½ to L.32 : 1 : 10½, (after deducting the sum of L.18, 15s. stated to be due by this establishment to Mr Blackwood, bookseller, for firemen regulations, which have not been delivered, and which the Committee now decline to receive,) being the total amount of debts and engagements remaining unpaid as at October last, after applying the balance remaining in bank to the liquidation of these debts.

The number of fires which took place in the bygone year are of the following description, viz. :—

A wright's shed totally destroyed,	1
Premises and goods partially injured,	18
Property, injury very trifling,	43
Foul chimneys,	28
False alarms,	4
Making in all,	94
JOHN ROBISON, <i>Convener.</i>	

Edinburgh, 15th December, 1828.

At an adjourned Meeting of General Commissioners of Police, the Right Honourable the LORD PROVOST in the Chair,

The Commissioners having considered the Report from the Fire-engine Committee, direct that the second clause of said Report be struck out, and approve of it as now amended, and that the same be printed and circulated as formerly.

Extracted by

JOHN THOMSON, *Clerk.*

Abstract of the Annual Account referred to in the preceding Report.

INCOME.

1. Contributions from Fire Insurance Offices.

From Caledonian,	L.32	0	0
— Friendly,	32	0	0
— North British,	32	0	0
— Sun,	20	0	0
— Guardian,	20	0	0
— Norwich Union,	20	0	0
— Royal Exchange,	20	0	0
— Imperial,	5	0	0
— Atlas,	5	0	0
— Hercules,	32	0	0
— Scottish Union,	32	0	0
— Insurance Company of Scotland,	32	0	0
— West of England,	5	0	0
— Alliance,	10	0	0
— London Union,	5	0	0
— Phoenix,	20	0	0
— British,	5	0	0
— Dundee,	3	0	0

In all, from Insurance Companies, L.330 0 0

	Brought forward,	L. 330 0 0
2.	Contribution from city of Edinburgh,	80 0 0
3.	Contribution from Police Funds,	950 0 0
4.	Miscellaneous receipts.	

1828.

Jan. 21.	Proceeds of old metal sold,	9 4 0
Oct. 1.	Interest from Bank of Scotland on deposit account,	4 10 9
	Total income,	L.1373 14 9

EXPENDITURE.

1.	Salaries,	L.147 2 0
2.	Pay to firemen, &c. viz.	
	Permanent pay,	L.97 10 10
	For exercise,	27 7 6
	For fires,	447 0 0
	For precautionary turns-out, &c.	14 14 6
		<u>586 12 10</u>
3.	Refreshments,	3 15 7
4.	Tear and wear, viz.—	
	Of engines, hose, &c.	L.47 5 11½
	— Clothing,	1 1 6
	— Fire-cocks, including new ones,	99 8 2½
		<u>147 15 8</u>
5.	Rent and repair of engine-houses,	13 16 6
6.	Miscellaneous disbursements,	67 16 6
		<u>966 19 1</u>
	Surplus income this year applied to liquidation of former deficit,	L.406 15 8

No VII.

Report of the Fire-engine Committee to the General Board of Commissioners of Police.

Edinburgh, July 22, 1829.

THE Committee deem it proper to submit to the Board the following abstract of the general account of the fire-engine department, from 1st October, 1828, to 15th May, 1829, the commissioners having lately ordered the accounts to be balanced at each Whitsunday, instead of 1st October, as formerly.

By the abstract, compared with the accounts of the preceding year, it appears the annual expenditure continues nearly the same.

The Scottish Union, Hercules, and Friendly Insurance Companies having agreed to augment their annual contributions from L.32 to L.60 each, will diminish the expense to the police funds; and the Committee still hope that the other insurance companies in Edinburgh will be induced to follow the same liberal example, as they must be well aware of the great benefit which they derive from the establishment, and the importance of its being kept up in an efficient manner. The Committee regret to observe, that the Dundee Insurance Company, during the course of the year, declined to pay their contribution of L.3.

The Committee have every reason to be satisfied with the manner in which Mr Braidwood continues to conduct this department.

The number of fires, &c. which took place in the above period, were of the following description, viz.

A smith's shed totally destroyed,	1
Premises and goods damaged,	9
Property partially destroyed,	30
Foul chimneys,	63
False alarms,	1
	104

THOMAS BLACKWOOD, *Sub-Convenor.*

Edinburgh, 27th July, 1829.

At an adjourned Meeting of General Commissioners, held this day, the foregoing report was approved of, and ordered to be printed.

JOHN THOMSON, *Clerk.*

*Abstract of the General Account of the Receipt and Expenditure
of the Edinburgh Fire-engine Establishment from 1st October,
1828, to 15th May, 1829.*

INCOME.

1. Contributions from Fire Insurance Offices.

From Caledonian, ...	L.32	0	0
— Friendly, ...	32	0	0
— North British, ...	32	0	0
— Sun, ...	20	0	0
— Guardian, ...	20	0	0
— Norwich Union, ...	20	0	0
— Royal Exchange, ...	20	0	0
— Imperial, ...	5	0	0
— Atlas, ...	5	0	0
— Hercules, ...	32	0	0
— Scottish Union, ...	32	0	0
— Insurance Company of Scotland, ...	32	0	0
— West of England, ...	5	0	0
— Alliance, ...	10	0	0
— London Union, ...	5	0	0
— Phoenix, ...	20	0	0
— British, ...	5	0	0

In all, from Insurance Companies, L.327 0 0

2. Contribution from city of Edinburgh, ... 80 0 0

3. Contribution from Police Funds, ... 150 0 0

4. Miscellaneous receipts.

1829.

Jan. 23. Received from Scottish Union for expenses incurred in extinguishing a fire in the Scottish Brewery Company, Leith, ... 21 8 4

May 15. Interest from Bank of Scotland on deposit account, ... 1 5 11

Total income, L.579 14 3

EXPENDITURE.

1. Salaries,	L.110	12	0
2. Pay to firemen, &c. viz.			
Permanent pay,	57	1	8
For exercise,	19	1	0
For fires,	274	11	0
For assistance at ditto,	5	7	0
For precautionary turns-out, &c.	4	10	0
	L.360 10 8		
3. Refreshments,		2	11 2
4. Tear and wear, viz.—			
Of engines, hose, &c.	L.72	13	5½
— Clothing,	14	6	0
— Fire-cocks, including new ones,	59	17	2
	146 16 7½		
5. Rent of engine-houses,		18	10 0
6. Miscellaneous disbursements,		46	19 11
Total expenditure,	L.685	19	6½
Receipt, as per preceding page,	579	14	3
Excess of expenditure beyond the receipt,	L.106	5	3

*General View of the Debts on Account of the Fire-engine
Establishment, as at 15th May, 1829.*

Excess of expenditure as above,	L.106	5	3½
Deficits at 1st October, 1828, as per last account,	32	1	10½
	L.138 7 2		
Whereof due on account of expenditure at 15th May, 1829,	L.101	3	4½
Balance due to trea- surer,	L.52	16	8
Less sum in Bank,	15	12	11
Sum as above,	37	3	9
	138 7 2		

p. 132

TABLE
Showing the number of Fires which have occurred in each
Year since the Establishment of the Fire-engine Corps.

Year.	Total Losses.	Considerable Loss.	Trifling Damage.	Foul Chimneys.	False Alarms.	Total.	Observations.
From 1st October, 1824-25	11	12	14	9	2	48	
1825-26	7	18	31	17	7	80	
1826-27	1	12	55	39	6	113	The total loss this year was a boat builder's shed on the banks of the Canal.
1827-28	1	18	43	28	4	94	The total loss this year was a wright's shop, built of wood, value, with contents, under L.50.
1828-29	1	9	56	118	10	194	The total loss here stated was a smith's shop, built of wood, which, with contents, did not exceed L.30 in value.

In examining the above Table, it will be observed, that serious fires decrease as the number of alarms increase. The cause of so many alarms in 1828-29 was, that a considerable number of fires having been observed to arise from foul chimneys, the firemen were sent to every one from which the slightest danger was apprehended.

The number of houses, shops, and assessable places, within the bounds of Police, is 29,000, including every place which pays a separate rent, although there are sometimes several of these under one roof. The average of fires for the above five years is about 105, inclusive of such cases of foul chimneys as have been considered dangerous; being one fire to each 276 houses.

In Paris, from an average of 20 years, it is found that 540 fires happen annually, and as the number of houses is supposed to be 26,000, this gives rather more than 2 fires per 100 houses. Owing, however, to the promptitude and efficiency of the corps of *Sapeurs Pompiers*, the amount of loss is computed to be so small as 1-23,000 of the whole, or about the value of one house burned out of 500 which catch fire.

The following extract, from a letter of Sir Patrick Walker's in the Scots Magazine of 1814, No 9, is inserted to show, that the necessity for an organised fire-engine establishment has been long felt here: it contains, moreover, many judicious remarks on the bad consequences which arise from the imperfect way in which engines and firemen are generally brought forward on occasions of fire in most towns in this country:—

"I happened to be one of those who took an active part in endeavouring to arrest the progress of the late destructive fire at Bishop's Land, High Street,—a circumstance I mention merely, as it enabled me to remark the misfortune attending a total absence of combined and connected aid, which must often render abortive all exertions, or at least expend unnecessarily the labour of many individuals, whose anxious and philanthropic zeal leads them, on such occasions, to exert themselves freely, not without danger.

"Under this impression, allow me to state a general view of the chief defects to which I have been a witness, in the means of assistance used in cases of fire, with a few hints at their improvement, for the consideration of those better qualified to judge than I can pretend to be.

"The first and chief one originates in having Company Engines, which creates a degree of jealousy among the men who work them, that, I lament to say, seems, for most part, to increase with the fury of the flames; and at the moment when all success depends upon a union of their efforts, then are they the most discordant. The other night exemplified the truth of this in a most marked degree. A premium, no doubt, adds to the inducement to hasten forward the engines; but that is a small part of the business, for you have soon many more engines than you require, or have water for; and in place of two or three well supplied, according to the circumstances of the case, you have a whole dozen of them running counter to, and depriving each other of the requisite supply of water; much of which is not only consequently wasted, but perhaps also no engine has a sufficient supply to enable it to work with effect; of course, the exertion of all is diminished, and the character of a good engine too often lost.

"The most effectual remedy is to abolish all names, or marks, that distinguish company engines, and form the whole into one body upon military principles: a regiment, as it were, would be formed of firemen, and the men, as in companies, would be attached to the different engines, which would be, like them, numbered. The men of each company, or engine, classed according to their individual qualifications under intelligent men as non-commissioned officers, so as to form a regular gradation and chain of responsibility, from the highest to the lowest, would enable you to work an engine with all the regularity of a piece of artillery, and men could be easily detached on particular services, such as to strengthen the operations of a particular engine, &c. as occasion might require: thus a great and combined effect would at once be given to the whole, in a way that must ensure success, and prevent accidents.

"The second evil is the waste of water occasioned by hand-carrying, which of itself creates a great confusion. If the remedy above suggested is adopted, this will, as a subordinate part of it, be at the same time remedied; for the combined interest of the whole will lead the firemen to join their united pipes to the fire-cock, which is often beyond the reach of those of any individual engine, and, of consequence, a more regular supply of water will, without waste or confusion, be brought to the point of action, and be distributed, under the direction of the superintending officer, to such engines as he may judge most serviceable, either from superiority in their equipment or their position."

*List of Articles belonging to the Edinburgh Fire-Engine
Establishment, January, 1830.*

THREE 7-inch barrel-engines, something similar to but larger
than the one shown in plates 1, 2, 3, and 4.

Three poles, as in plate fig.

Three ditto for horses.

Four 5-inch barrel-engines, with their carriages, as in plate 5.

One 2½-inch ditto, used as a proving-pump for leather hose.

Six Hand-engines, (these are of no use at fires.)

Two large water-carts.

Eight tanks, as in plate 7, figs. 1 and 2. } These are seldom wanted
since the number of fire-
cocks has been augmented,

Three suction-tubs with carriages, see plate 7, figs. 3 and 4.

One hand-cart.

One spare pair of wheels for 5-inch barrel-engines.

Twelve hatchets.

Twelve saws.

Eighteen shovels.

Fourteen mattocks.

Eight boat-hooks.

Eleven distributors, see plate 6, fig. 2.

Sixteen directors or jet-pipes, see plate 4, fig. 2.

Two spare nozzles.

155 canvass buckets.

Eight tin ditto.

Eight 8-foot ladders.

Two 14-foot ditto.

One triangle, as in plate 8, fig. 2.

Twenty keys for fire-cock doors, see plate 6, fig. 3.

Twelve pickers for ditto, see plate 6, fig. 4.

Thirteen pair of wrenches for coupling-joints of hose, plate
4, figs. 3 and 4.

Six crow-bars.

Six turn-screws.

One steel cross-bow.

Two wooden cones, with eight cords and bullets.

One chain-ladder, 80 feet long, plate 6, fig. 8.

Two single chains, 80 ditto.

Eight 80-feet lines.

Four 50-feet ditto.

One 4-inch rope, 130 feet.

1860 lineal feet of rivetted hose, in 47 coils or lengths.

Forty feet ditto of sewed ditto, in 1 ditto ditto.

Forty-eight feet of suction-pipe, in 8 lengths.

Fifty-six pair of coupling-joints, attached to the above, plate 4, fig. 4.

Twenty-two pair of spare ditto.

Twenty-five rolls of sheep-skins.

Smiths' vice, hammers, saws, and tools of different descriptions for repairing the above ; also a greasing table, stove, gymnastic ropes, poles, tackle for drying hose, &c.

Two silver-mounted helmets for Master of Fire-engines.

Two dresses for ditto, with silver badge.

Eighty brass-mounted helmets for firemen, plate 6, fig. 5.

Eighty blue jackets for ditto.

134 pair trowsers for ditto.

Eighty waist-belts with brass buckles.

Twenty-four small hatchets and hammers.

Twenty-four cords attached to waist-belts.

76 $2\frac{1}{2}$ -inch fire-cocks, see plate 6, fig. 1.

56 2-inch ditto.

30 $1\frac{1}{2}$ -inch ditto.

1 1-inch ditto.

163 in all, attached to the Water Company's mains, with iron doors, covers, &c.

Two spare fire-cocks for repairs.

Four spare firecock doors with cast-iron frames.

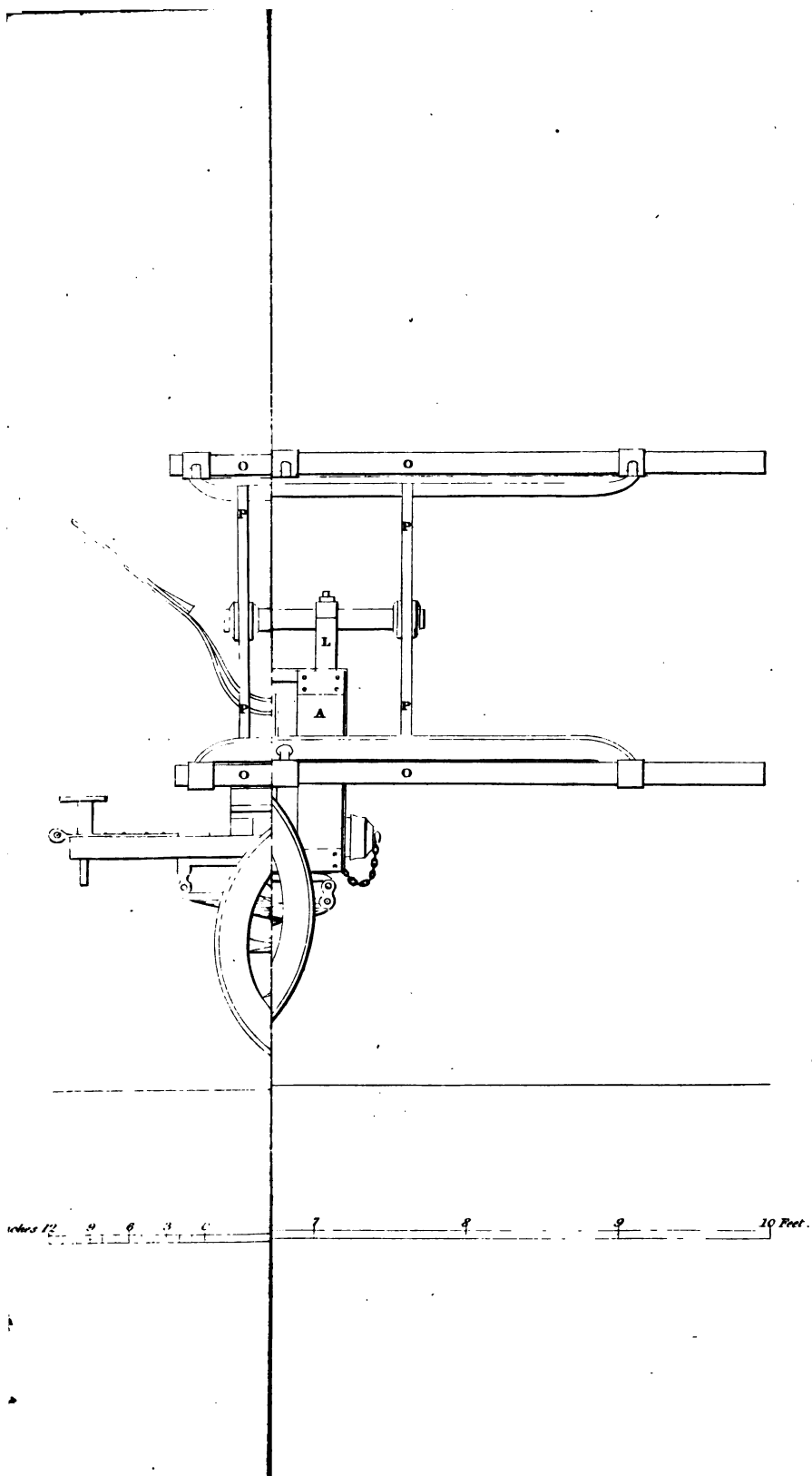
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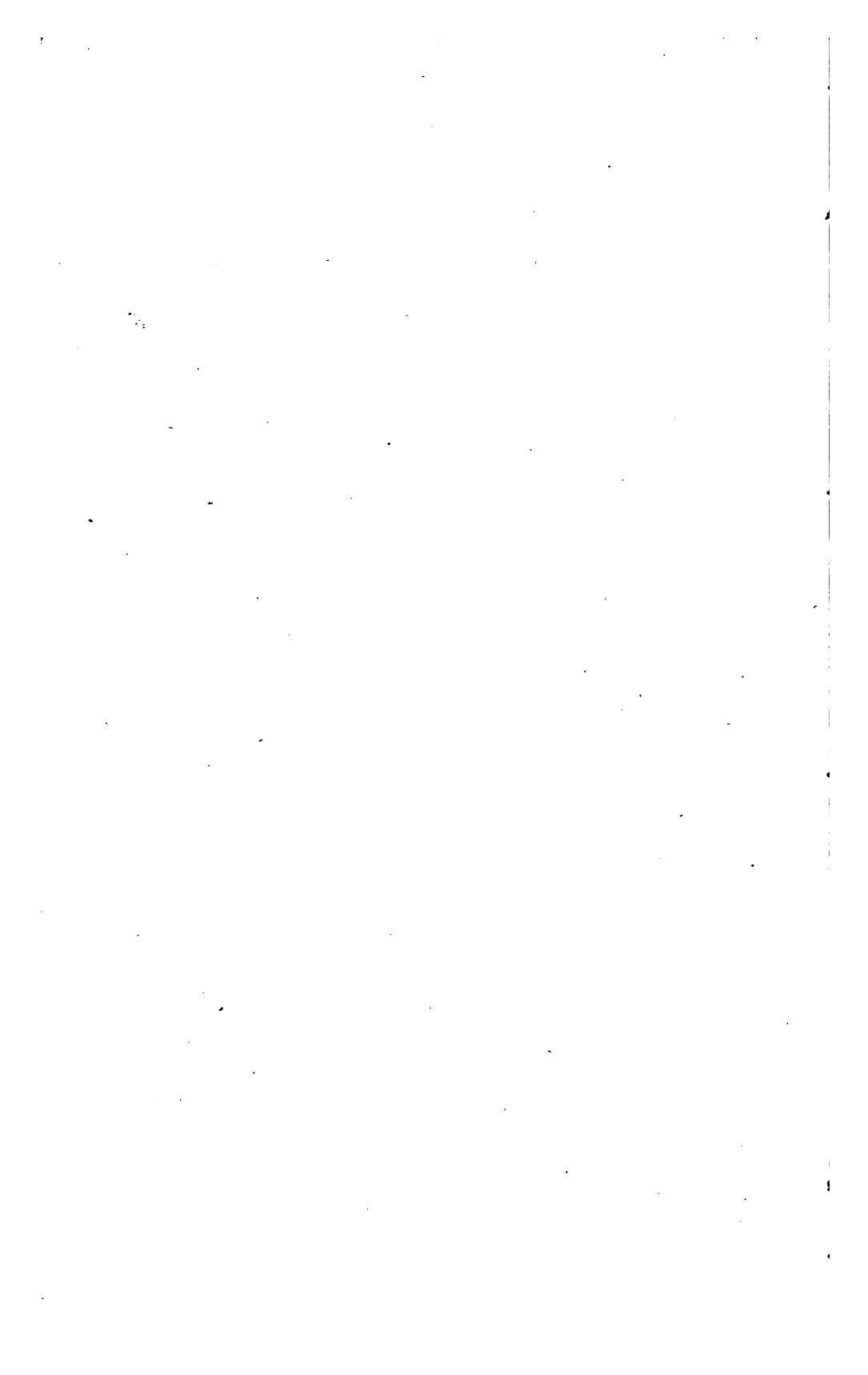
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1	Duff, Adam, Sheriff-depute of the county of Edinburgh,	1
1	Drummond, Geo. Scotland Street,	1
2	Douglas, Wm., Drummond Place,	1
1	Dove, James, Greenside Lane,	1
1	Dodds, Peter, Granton,	1
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	Edinburgh School of Arts,	1
	Edinburgh Gas Light Company,	1
	Forbes, Peter, bailie,	1
	Gairdner, Andrew, Forth Street,	1
	Graham, James Gillespie, architect, Albany Street,	1
	Gilkie, Alexander, Register Street,	1
	Gibson, James, Saunders Street,	1
	Gifford, James, Newington Place,	1
	Hay, Sir John, Bart,	1
	Hamilton, Thomas, architect, York Place,	1
	Hutchins, Thomas, Heriot Row,	1
	Hill, William, Henderson Row,	1
	Hill, James, Windsor Street,	1
	Henderson, Thomas, of Press,	1
	Harvie, John, Blenheim Place,	1
	Haldane, James, Broughton Street,	1
	Henderson, John, Leopold Place,	1
	Hogg, Alexander, Frederick Street,	1
	Haig and Son, James, Lochrin,	1
	INSURANCE COMPANIES.	
	Caledonian Insurance Company,	10
	Friendly Insurance Society,	10
	Hercules Insurance Company,	10
	Insurance Company of Scotland,	5
	North British Insurance Company,	10
	Norwich Union Insurance Company,	1
	Royal Exchange Assurance, London,	5
	Scottish Union Insurance Company,	10
	West of Scotland Insurance Company, Glasgow,	12
	Jardine, James, engineer, Queen Street,	1
	Johnston, William, Summerhall Place,	1
	Johnston, Robert, James' Square,	1
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	Kerr, William, Charles Street,	1

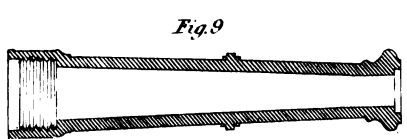
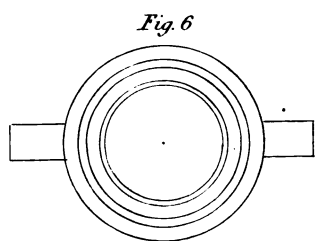
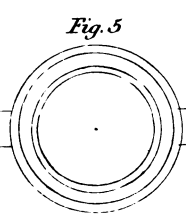
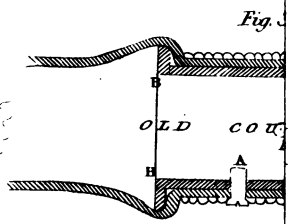
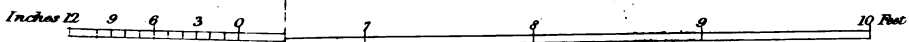
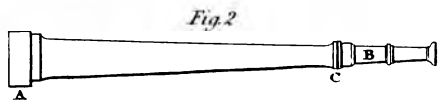
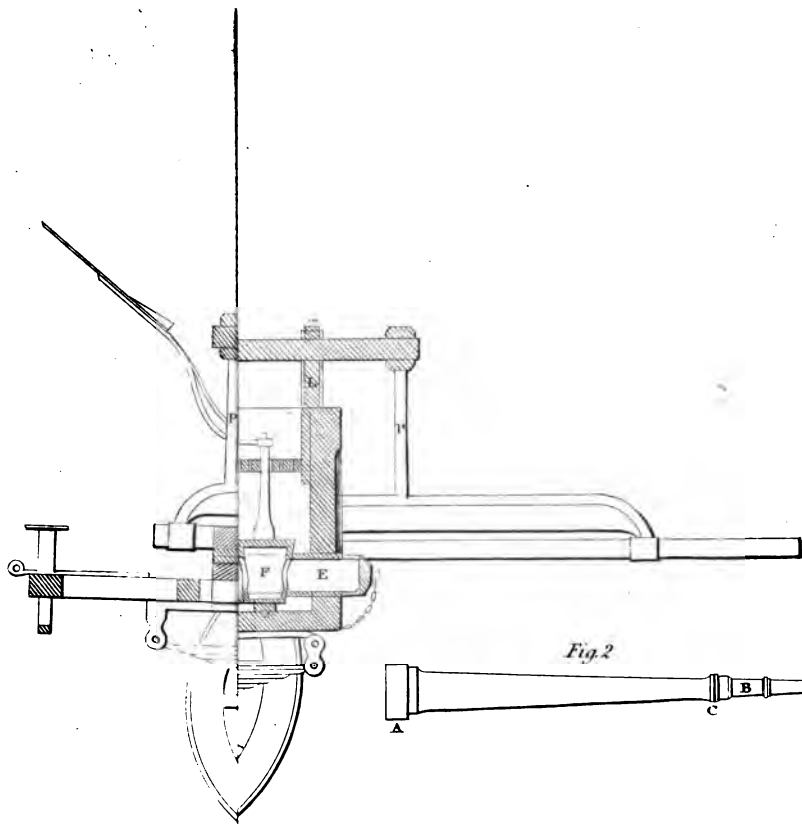
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Leggat, Alexander, Deacon of the Incorporation of Skinners,	1	Thomson, Robert, Buccleuch Place,	1
Luke, Adam, Buccleuch Place,	1	Tilley, W. J., London, -	40
Lawrie, Archibald, bailie,	1	Thomson, John, Leopold Place,	1
Lang, Peter, -	1	Tait, Geo., Sheriff-substitute, Edinburgh, -	1
Macfarlane, J. F. York Place,	1	Tullis, William, Viewforth,	1
Muir, W. St John Street,	1	Thomson, George, George's Square,	1
Murray, David, Middleby Street,	1	Thomson, James, Greenside House,	1
Murray, David, Hanover Street,	1	Vos, John, Dublin Street, -	1
Magistrates of Edinburgh for Council Chamber, -	1	Walker, Sir Patrick, Knight,	1
Monro, William, James's Square,	1	Watson, John, Annandale Street,	1
Mure, William, Leith,	1	Wylie, David, Northumberland St.	1
Mitchell, Hugh, Howard Place,	1	Wilson, Geo., St Andrew's Square,	1
Macpherson, John, Graham Street,	1	Waldie, James, Adam Street,	1
Mackenzie, Roderick, Forth Street,	1	Waldie, George, Montrose,	1
Milne, James, Wharton Lane,	5	Writers to the Signet, Library of,	1
Murray, John, Drummond Place,	1	Young, James, St John Street,	1
Macgibbon, Charles, East Claremont Street, -	1	BELFAST.	
Muirhead, Claud, Heriot Row,	1	Commissioners of Police of, -	4
M'Lagan, David, George Street,	2	CARLISLE.	
Newbigging, David, Broomhouse,	1	Commissioners of Police of, -	1
Neil, John, London Street,	1	CAMBRIDGE.	
Nun, Lieutenant, Staff-Adjutant,	1	Fenwick, J. T., St John's College,	1
Paterson, Robert, Rankeillor Street,	1	DALKEITH.	
Peffer, ——— Haddington,	1	Town treasurer of, -	1
Paterson, James, Buccleuch Street,	1	DUNDEE, per favour of John Home, Esq.	
Rosebery, Right Hon. the Earl of,	1	Anderson, John, -	1
Robison, John, Atholl Crescent,	5	Adamson, Robert, -	1
Reid, Robert, architect, Charlotte Square, -	1	Balfour, Alexander, of Airly Lodge,	1
Ross, Alexander, Salisbury Road,	2	Blair, David, younger of Cookston,	1
Ross, David, St Andrew's Street,	1	Brown, James, -	1
Ramsay, Alexander, Grange Place,	1	Brown, Andrew, -	1
Ramsay, John, Buccleuch Place,	1	Brown, William, -	1
Ritchie, John, Howe Street,	1	Brown, John, -	1
Ruthven, John, New Street,	1	Baxter, Thomas, -	1
Stuart, James, Royal Exchange,	1	Baxter, John Boyd, -	1
Sibbald, John, Meadow Place,	1	Bell, Thomas, Provost of Dundee,	1
Sinclair, Alexander, James's Square,	1	Boyack, William, -	1
Sawers, Thomas, Bank Street,	1	Bisset, William, -	1
Scott, William, Prince's Street,	1	Colman, John, bailie, -	1
Sclater, Robert, Clerk Street,	1	Carmichael, Charles, engineer,	2
Slight, James, Brown Street,	1	Cuir, William, -	1
Scott, Archibald, Northumberland Street, -	1	Chalmers, James, -	1
Shotts Iron Company, -	2	Campbell, John, -	1
Strachan, John, Gilmour Place,	1	Constable, William, -	1
Scott, Alexander, Bristo Street,	1	Dick, Alexander, -	1
Stevens, William, Deacon of Incorporation of Waulkers,	1	Dick, Robert, -	1
Small, George, Mansfield Place,	1	Deuchar, George, -	1
		Eason, James, -	1
		Ferguson, William, -	1
		Gray, John, -	1

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Home, John, Superintendent of Police,	1	LEITH.	
Hill, James,	1	Leith Gas Light Company,	1
Hackney, William, Dean of Guild,	1	Callum, Thomas,	1
Jobson, David,	1	Dunnevan, F. G.	1
Keith, David,	1	M'Fie, John,	1
Law, David,	1	Whyte, ———,	1
Lawson, Alexander,	1	Kirkham, John,	1
Lindsay, Wm., of Carolina's Port,	1	MANCHESTER, per favour of John	
Morton, John,	1	Thorpe, Esq.	
Macewan, David,	1	Alliance Assurance Office,	1
Miller, John B., bailie,	1	Commissioners of Police,	4
Mathewson, John,	1	Grundy, Mr George,	1
Milne, Thomas,	2	Guardian Assurance,	2
Miller, Aikman,	1	Holt, Mr James,	1
Pullar, James,	1	Levyssolm, E. H., Agent for the	
Reid, James,	1	Globe Insurance Office,	1
Reid, William,	1	Manchester Assurance Company,	1
Rodgers, Charles,	1	Norwich Union,	1
Sturrock, John,	1	West of England,	1
Smart, David,	1	—	1
Symers, George,	1	Protector Office,	1
Soot, James, bailie,	1	Phoenix Insurance Company,	1
Saunders, James,	1	Rose, William,	1
Shepperd, Robert,	1	Royal Exchange Assurance,	1
Stuart, David,	1	Rooke, Mr Joseph,	1
Stephen, John,	1	Thorpe, John, jun.	1
Small, Andrew,	1	NEWCASTLE.	
Soot, Alexander,	1	Gardner, John,	1
Thomson, James, Convener of		PAISLEY.	
Trades,	1	Jeffrey, George, Superintendent of	
Taylor, James,	1	Police of,	4
Thoms, George, jun.	1	PERTH.	
Webster, Alexander,	1	Cant, James, Deacon of the In-	
Willison, Andrew,	1	corporation of Hammermen,	1
GLASGOW.	1	Craigdallie, James, do. of do. of	
Liddel, Andrew, Glasgow,	1	Tailors,	1
Davidson, James, Superintendent		Gellatly, William, Superintend-	
of Fire-engines,	1	ent of Fire-engines,	1
HOLLAND.		Ritchie, Thomas, Deacon of the	
Heyning, John,	1	Wrights,	1
INVERNESS.		Thomas, James, Clerk to the	
Provost Grant,	3	Commissioners of Police,	1
Bailie Ferguson,	1	Young, George, Deacon of the	
		Glovers,	1

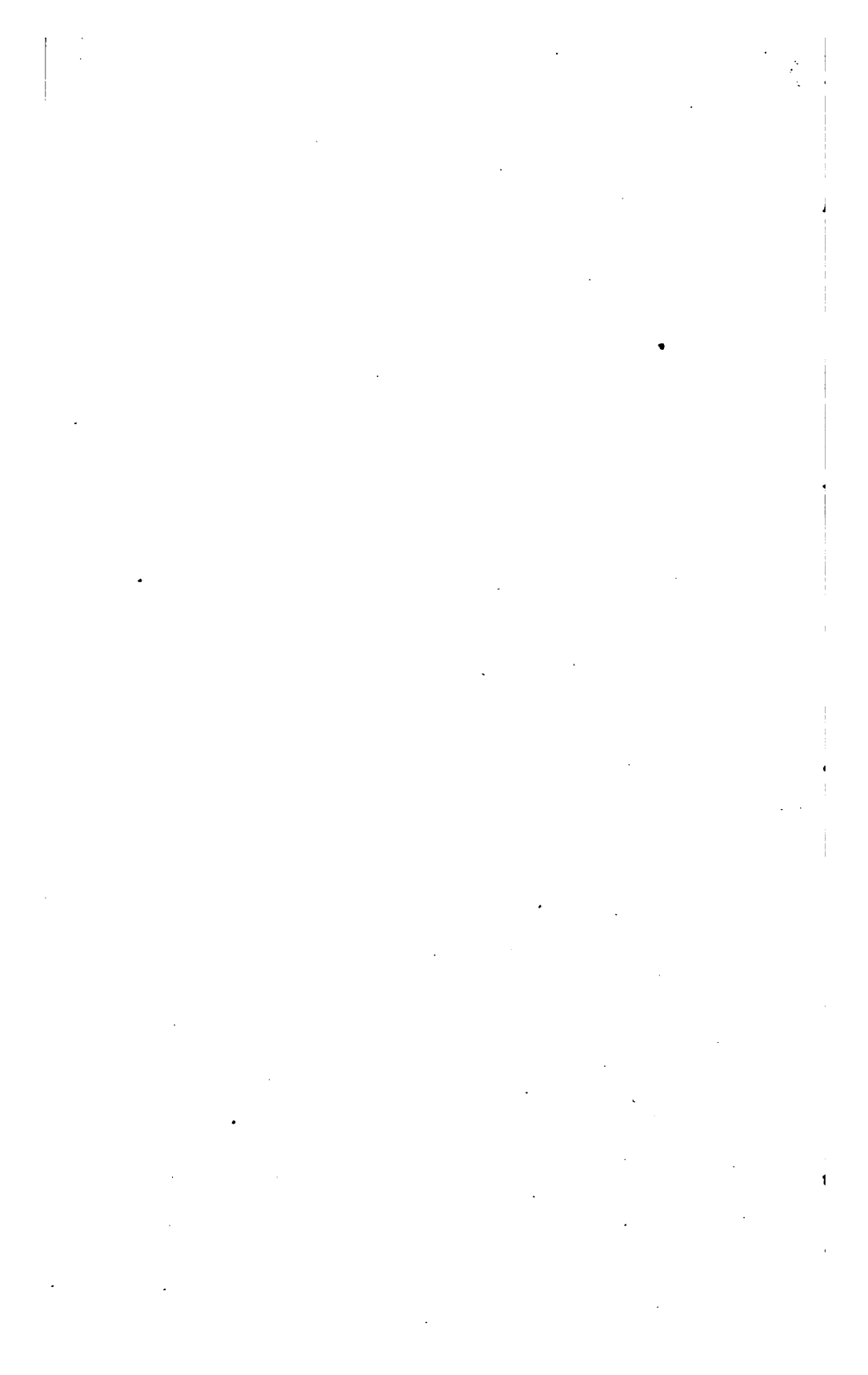
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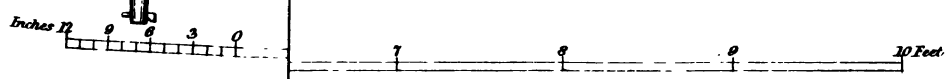
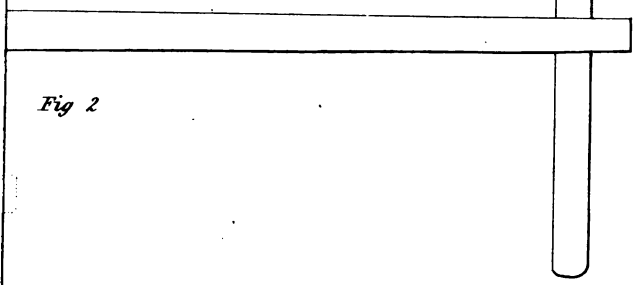
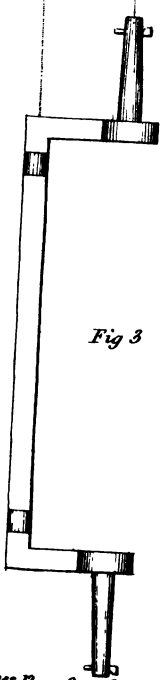
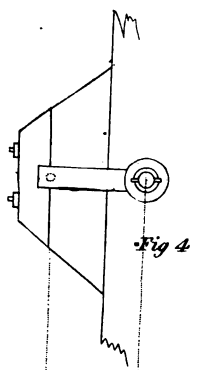
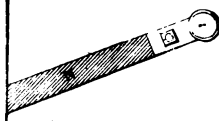




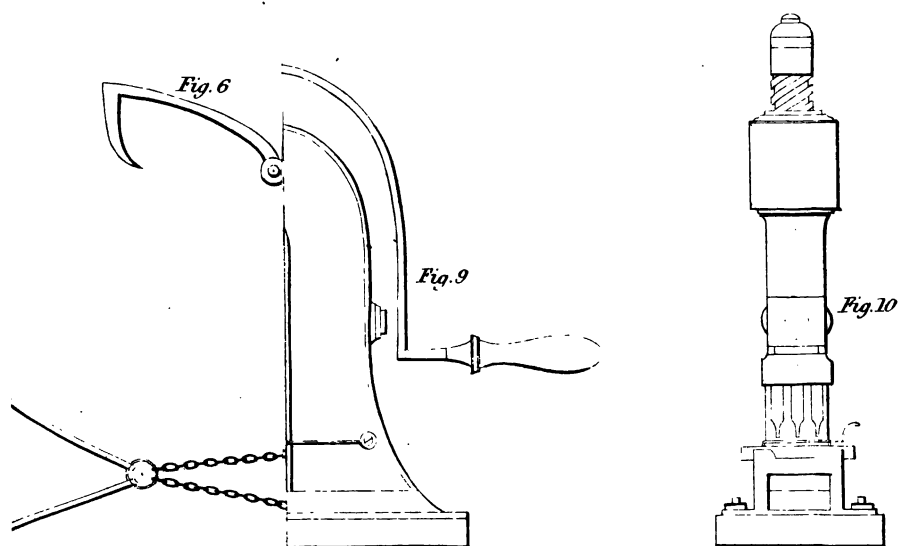
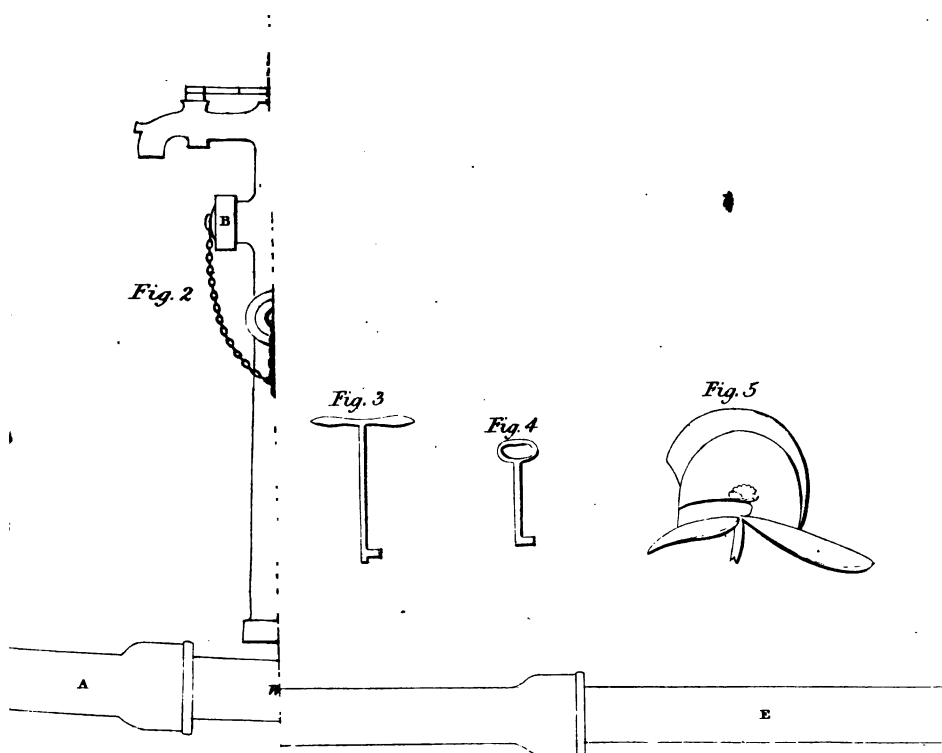


12 inches









SCALE for Punching Press

4 3 2 1 Foot

Inches 12 9 6 3 0 7 8 9 10 Feet

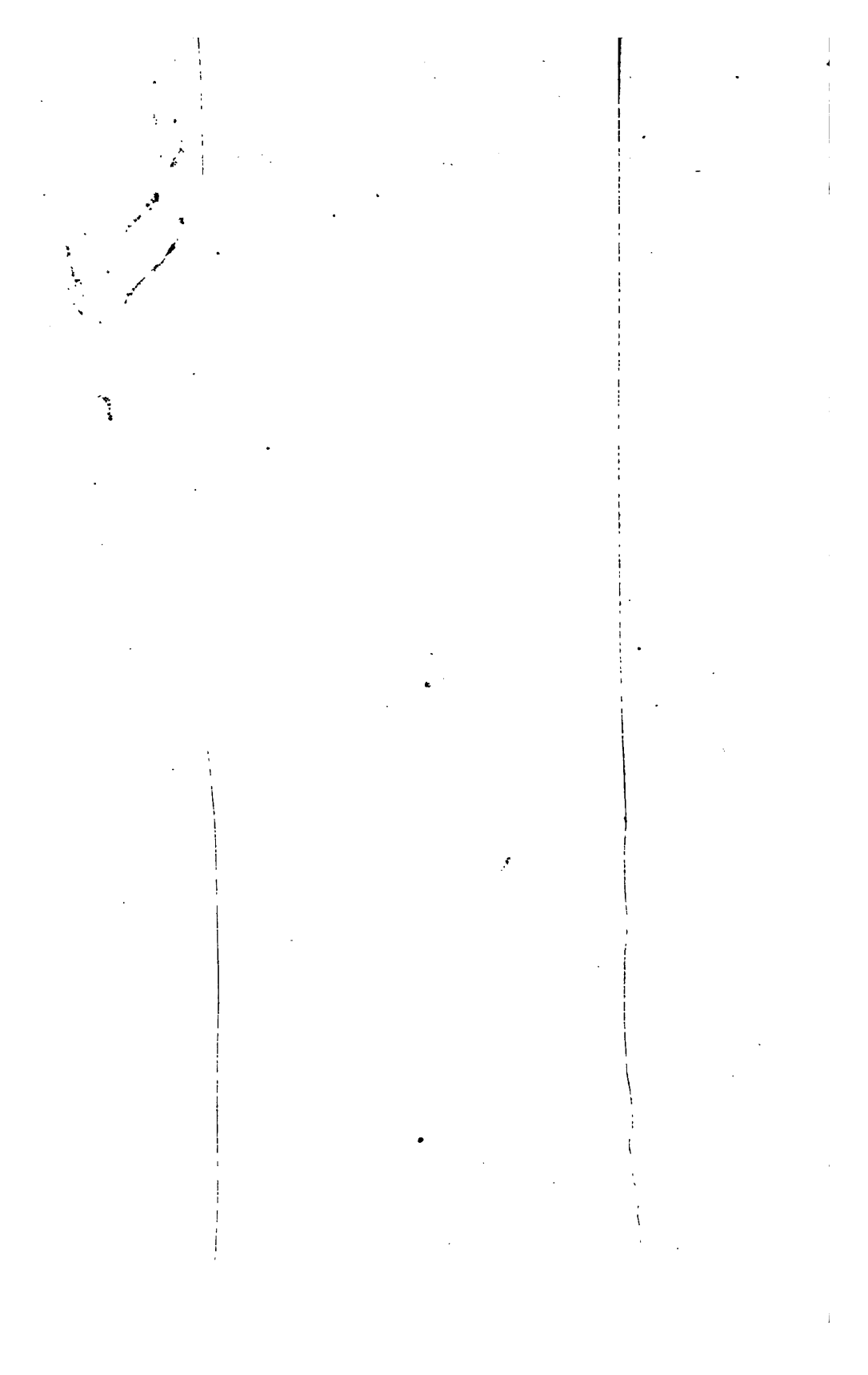


Fig 3

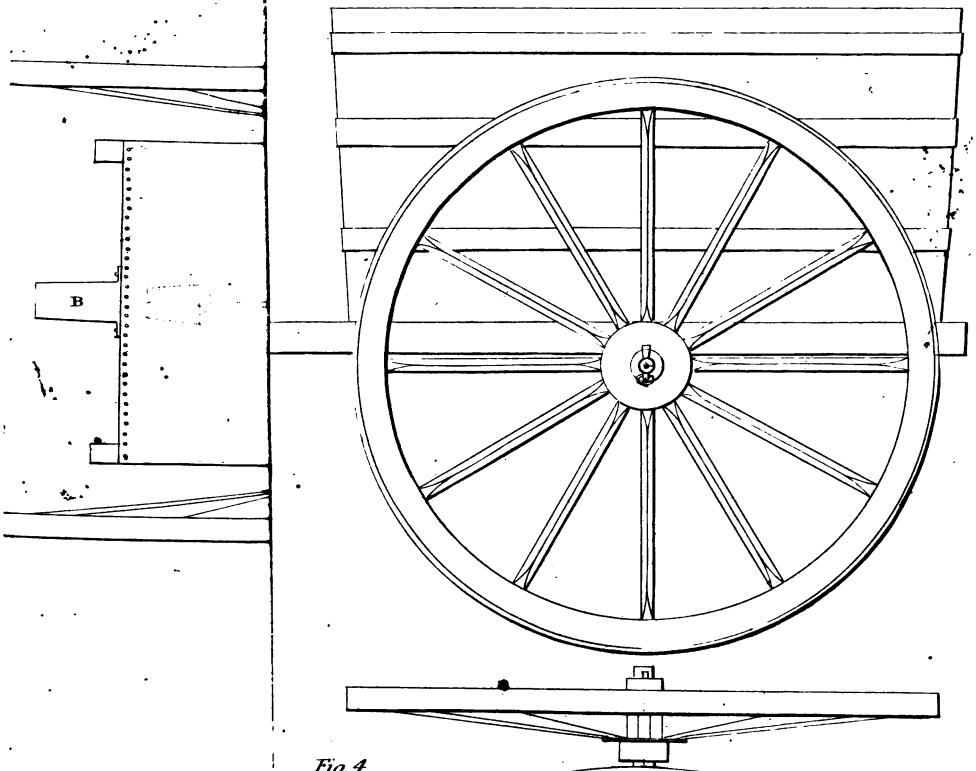
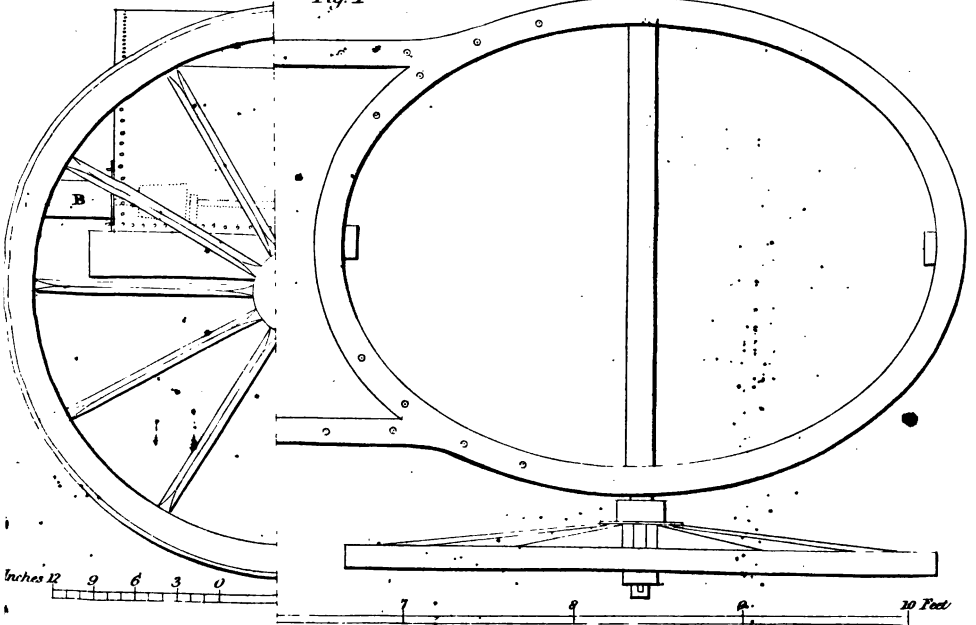


Fig 4



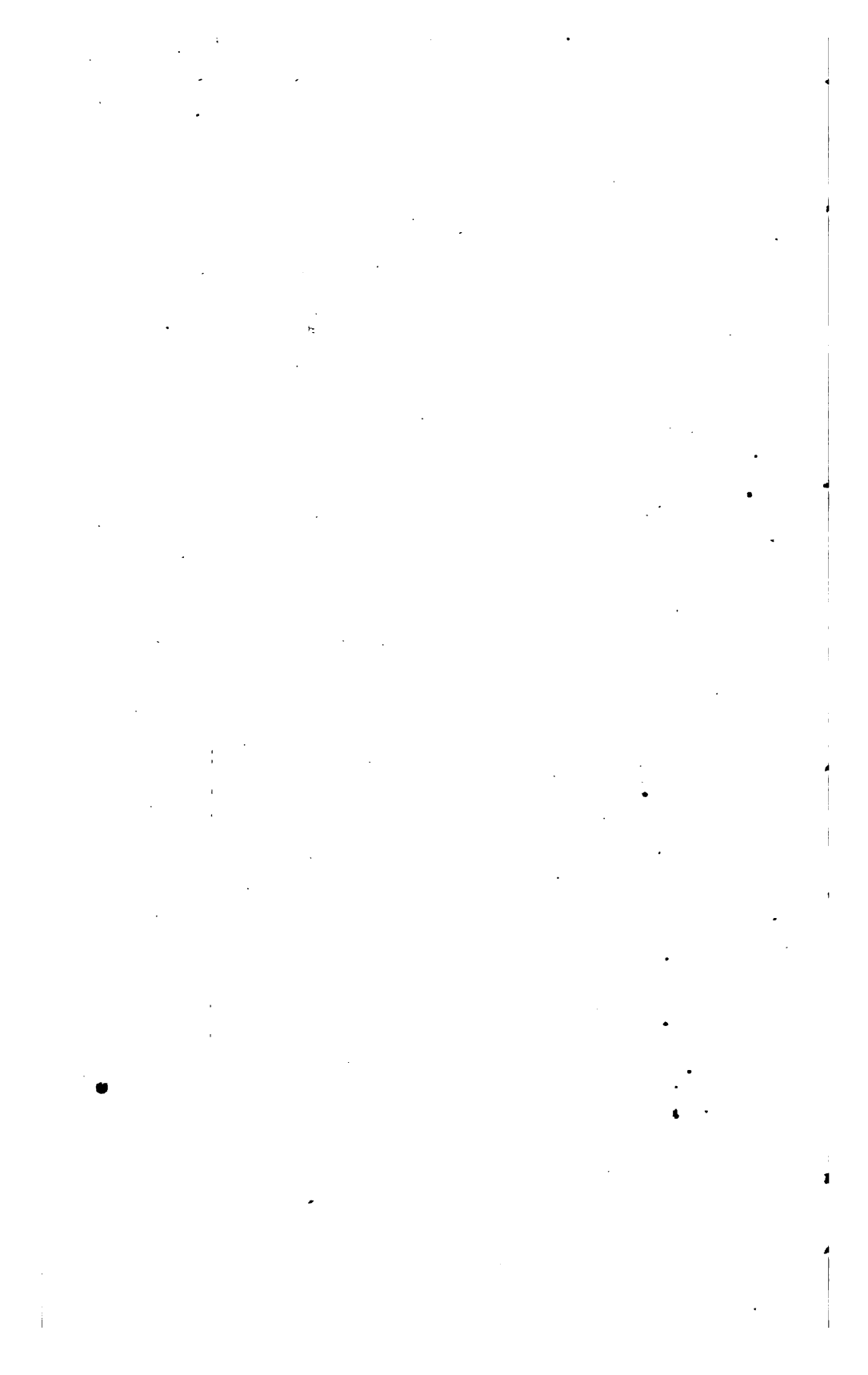
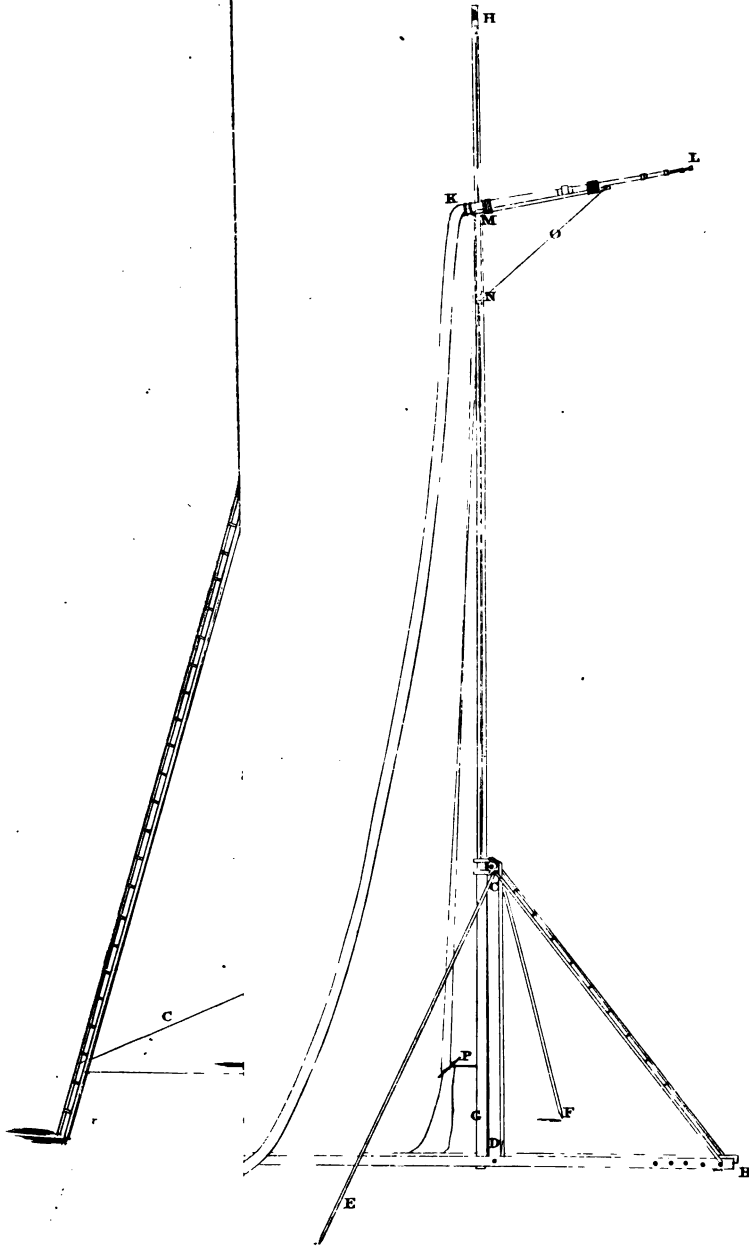
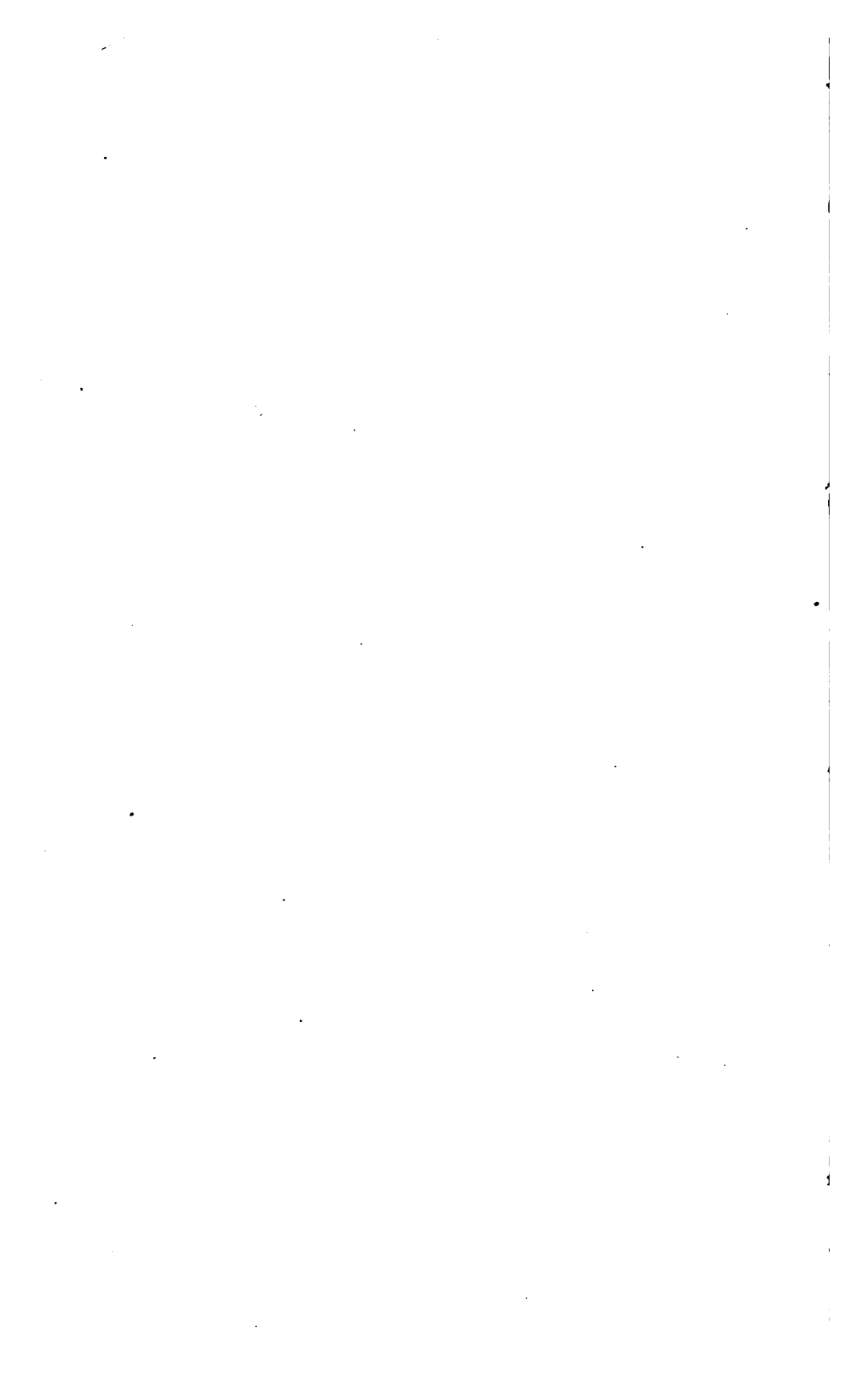


Fig. 3



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